American Aviation

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EQUIPMENT

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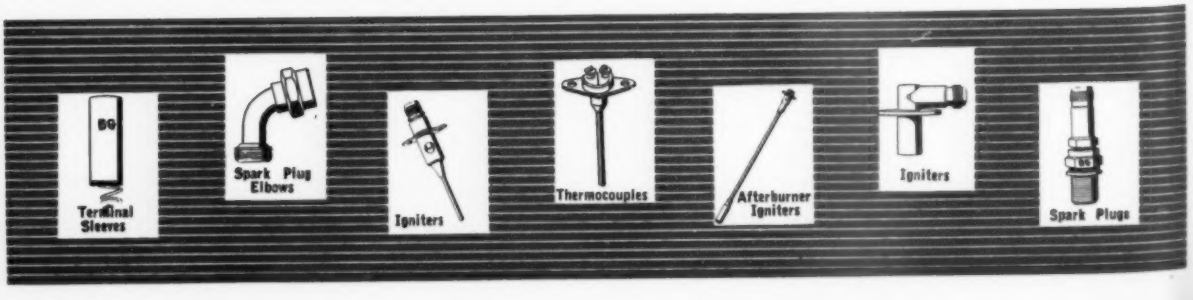

Manufacturers are just about at the peak of military aircraft production. If the Administration's spending cut forces a reduction in Air Force wings, primary result will be to lengthen the production decline.

A reduction would be almost certain to hit air transport first (AF is scheduled to have 17 air carrier wings). Principally affected would be C-118's (DC-6) and C-121's (Constellations).

Industry is puzzled about President's statement that economies won't reduce effective military strength because, among other things, lead times will be cut. There's been a shortening of lead times in the past few years, but nothing substantial. Further reduction in fiscal 1954 is improbable—orders are let and production is under way. How another cut is to be made remains a mystery.

•

Emphasized in Eisenhower's executive order reorganizing the Defense Department is the fact that power is to be centralized in Defense Secretary Wilson and his team. Munitions Board and Research and Development Board are abolished; their functions will be taken over by Assistant Secretaries.

Control is definitely in civil hands. Pentagon's military brass won't be calling the shots, as far as top decisions are concerned. They've had little voice in revising defense aspects of the Truman budget.

•

Another executive order—not yet issued at press time—has raised strong airline opposition. Effects would be far-reaching: transfer of subsidy payments from Post Office to CAB, establishment of certain cost principles for Board to follow in separating mail pay from subsidy.

Idea that mail pay shall equal cost to the carriers of the mail service, including a fair return, and that everything else is subsidy, is opposed by the carriers, who say many other facts must be considered. And no other regulatory agency has been restricted to cost in setting rates. The cost principle, incidentally, is in the controversial Kennedy-Heselton bills, now pending.

If order is issued (it was due May 1, was reportedly held up for more study), airlines will fight it in Congress. Such orders become effective in 60 days unless disapproved by constitutional majority of House and Senate.

•

Missiles still remain under the tightest security wraps of anything in the defense program. Only one or two basic missiles have been announced; virtually no contracts have been revealed. Yet there are over 300 contracts—many of which are outside the aircraft industry.

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Blunt statement by House Appropriations Committee on user charges for federal airways ("action and not mere promises is what is needed and expected") may stir things up.

There's been no widespread interest in such charges among legislators, busy with other problems. Commerce Department study on the subject isn't ready yet, and some sources believe it won't be too definite when it is—will be more of a "starting point" than anything else. However, committee's statement, made when reporting out Commerce's budget, can hasten action.

The Washington View

Where Does He Go from Here?

Washington reports that Gen. Hoyt S. Vandenberg will leave his post as Air Force Chief of Staff before the mid-June expiration date of his appointment. Such reports serve to point up the timeliness of announcing his successor and a determination of what future status is to become available to him. Although Vandenberg is now eligible for retirement—he qualified on April 30—it is not certain that he will retire.

If he is to remain in the picture, however, the poser is finding a suitable assignment for an ex-Chief of Staff, outside of the coveted post of chairman of the Joint Chiefs of Staff, now held by Gen. Omar Bradley. Never before has the problem been raised of reassigning a JCS member to a lesser post.

There is serious doubt in some quarters, though, that supporters of Vandenberg's candidacy for the JCS chairmanship can overcome demands of those Republican leaders, who are seeking sweeping changes, for a fresh approach to military problems.

Those advocating such changes are said to feel that new members are needed who will be more receptive to the new political leadership. Including Vandenberg's seat, a total of three vacancies that can be filled with new faces soon become available in the top military planning group. Incumbent chairman Gen. Omar Bradley's term and that of Gen. J. Lawton Collins, Army Chief of Staff, expire August 1. Term of remaining member, Admiral William Fechteler, Chief of Naval Operations, runs for two more years.

The Rugged Individualists

Possibility of the Government's coming to the assistance of aircraft manufacturers (and the airlines) in the building of commercial jet transports is becoming increasingly remote. The need may still be there but the demand, if there ever was any, is gone.

The incentive to provide Federal aid in the form of subsidy for the development, construction, and testing of commercial jet prototypes has been lost, and it was the manufacturers themselves that brought this turn of events about. Today no less than three of the major west coast plane builders are proceeding to go it alone to fill the commercial market's requirements—two with designs on the drawing boards and one with a plane already under construction.

It turns out just as well that these aircraft companies got under way when they did, particularly if there is to be an American-manufactured jet transport within the next three to four years, for again this year pending prototype legislation is not conceded a ghost of a chance of receiving approval. Bearing this out is the definitely negative attitude adopted by the new administration.

A forecast of the administration's disapproval was first drawn from remarks made by Robert B. Murray, Jr., Under Secretary of Commerce for Transportation. Murray has indicated that there will necessarily be recommendations against all pending bills for prototype aircraft construction as the Department does not and will not endorse them.

Failure to secure legislative action before has always been due to a lack of unified support from the manufacturers. They were not able to reconcile their differences on what was believed needed in the form of legislation. There are still no signs of any efforts being made to organize support behind a single measure. That the lawmakers have been left in a quandary is borne out by the fact that in three Congresses there has never been a prototype bill that so much as cleared a committee.

Job Security Rears Its Head

Republican leaders have been taken aback at the large number of key government job-holders they've tapped to be turned out of office who have turned up with claims of long-standing affiliations with the GOP.

A case in point was a recently contemplated change in the Civil Aeronautics Board General Counsel's Office. It had gone so far that a replacement was all lined up. But, when it was belatedly learned that the "target-for-ouster" was a life-long Republican, the intended dismissal was hurriedly called off.

Other staff changes at CAB, however, are definitely in the making, the emphasis being placed primarily on Civil-Service-exempted policy direction positions. Changes under study are reportedly being considered with the tacit approval of the Board's Republican majority.

There is not to be a full-blown house cleaning, according to one CAB member, but a few certain changes that it is hoped will have the effect of bringing the staff's thinking around to that favored by the Board. If the latter is accomplished, it will remove the stigma of charges that the Board has become a captive of its staff, observers predict.

. . . Preble Staver

TIME WAS when aircraft had no brakes. In those days, planes were light and slow enough to stop themselves before they "ran out of runway."

But as ships grew larger and faster, the problem of reducing the landing or ground run of aircraft became a threat to aviation's progress.

"Sprags" or claws were added to the tail skids, but these dug up the runways. Air brakes were found to be ineffectual at low speeds; automobile-type band brakes were too heavy and cumbersome. Ground loops and crack-ups were common.

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Where & When

May 14-17—9th Annual Forum, American Helicopter Society, Mayflower Hotel, Washington, D. C.

May 17—National Air Carnival (Armed Forces day), Municipal Airport, Birmingham, Ala.

May 18—National Fire Protection Assn., Aviation Seminar, Palmer House, Chicago.

May 18-22—5th National Materials Handling Exposition, Convention Hall, Philadelphia.

May 19-21—California Assn. of Airport Executives, Annual Convention, Clearmont Hotel, Oakland.

May 19-22—ATA Operations Conference, Park Plaza Hotel, St. Louis, Mo.

May 19-23—AWA Annual Convention, Dallas-Ft. Worth, Texas.

May 20-22—IAS, AIEE, ISA & IRE, joint National Telemetering Conference, Edgewater Beach Hotel, Chicago.

June 6—4th Annual Maintenance & Operations Clinic, Municipal Airport, Reading, Pa.

June 7-12—SAE, Summer Meeting, Ambassador & Ritz-Carlton Hotels, Atlantic City, N. J.

June 9-11—2nd Int'l Aviation Trade Show, Statler Hotel, New York.

June 11-13—5th Annual All-Woman Int'l Air Race, Welland, Ont., Canada, to New Smyrna Beach, Fla.

June 17-19—ADMA Mid-Year Meeting, Chateau Lake Louise, Alberta, Canada.

June 20—WNAA Banquet celebrating 25th anniversary Municipal Airport, Tulsa, Okla.

June 22-26—American Society for Engineering Education, Univ. of Florida, Gainsville.

June 29-July 2—ASME Semi-Annual Meeting, Statler Hotel, Los Angeles, including Air Cargo & Heavy Press for Light Metals Sessions.

July 1-3—University Aviation Assn., Summer Conference, National College of Education, Evanston, Ill.

July 3-7—7th All-Woman Transcontinental Air Race (sponsored by 99's).

July 9-12—6th Annual Aviation Exposition, Detroit Wayne-Major Airport, sponsored by Aero Club of Michigan.

July 15-16—IAS Annual Summer Meeting & Honors Night Dinner, IAS Building, Los Angeles.

Aug. 19-21—Western Electronics Show & Convention, Municipal Auditorium, San Francisco. Sponsored by IRE 7th Region and WCEMA.

Sept. 5-7—National Aircraft Show & 50th Anniversary of Powered Flight, Dayton, Ohio.

Sept. 21-25—Instrument Society of America, 8th National Instrument Conference & Exhibit, Chicago.

Sept. 29-Oct. 1—Aircraft Spark Plug & Ignition Conf., Champion Sparkplug Co., Toledo, Ohio.

Sept. 29-Oct. 3—SAE, Aeronautic Meeting & Aircraft Engineering Display, & Aircraft Production, Hotel Statler, Los Angeles.

Sept. 30-Oct. 1—AIEE, Aircraft Electric Equipment Conference, Seattle.

INTERNATIONAL

May 14-22—Federation Aeronautique Internationale Conference, Scheveningen, Holland.

June 16—ICAO Assembly, Brighton, England.

June 26-July 5—Int'l Aircraft Engineering Convention, Paris; and Int'l Aircraft Show, Le Bourget Airport, Paris, sponsored by French Aircraft Industries Association.

July 12-19—2nd Int'l Air Show, San Nicole Airport, Venice, Italy.

Aug. 25—ICAO Legal Committee, Rio de Janeiro.

Sept. 7-13—SBAC Aircraft Show & Flying Display, Farnborough, England.

Sept. 7-18—IAS-RAeS, 4th Int'l Conference, London, England.

Oct. 10—International Air Race, England to Christchurch, N. Z.

Nov. 1-22—IATA, Traffic Conferences, Honolulu.

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Editorial

Acute Coronationitis

THERE HAS BEEN MORE unmitigated nonsense popping up in England lately about the U. S. airworthiness certification of the de Havilland jet Comet than anything we've seen in a long time.

The British are accusing the U. S. of refusing to certificate the Comet, and Lord Brabazon of Tara, who heads up the British Air Registration Board, has made some awfully strange statements to the British press implying that America is afraid to certificate the Comet because this jet airplane is a threat to the dominance of American equipment in the skies.

by W. W. P.

Such a position is utterly ridiculous. First of all, our own Civil Aeronautics Administration has never received a request to certificate the Comet I and the IA, both of which are now in existence. No request has been received to certificate Comet III, which is still on the drawing board. How in the world could the CAA certificate Comet III when it doesn't exist? Since when has the CAA ever certificated any airplane without testing the real article? How under the sun could the British expect the CAA to certificate a British airplane still on the drawing board, when the CAA wouldn't dream of doing this for an American manufacturer? And isn't it true that the British ARB itself has not yet certificated the Comet III? If it had, this would be even stranger yet. An airplane isn't an airplane until it's been flown.

The CAA's position, which is the only conceivable one it could take, is that it will welcome the opportunity to pass any Comet through certification tests at any time a request is made and the airplane supplied for the testing. If the Comet meets our requirements, well and good. If it doesn't, that's too bad.

Why should the CAA change its rules and regulations to make a single exception for the British? Yet the CAA will treat the Comet in exactly the same manner as it treats U. S. aircraft. Fair enough?

What is not generally recognized on this side of the Atlantic is that the British Air Registration Board is *not* a government agency. The ARB is a private institution operating under a franchise from Parliament with exclusive rights to certificate aircraft operating in Britain. The Board consists of manufacturers, operators, insurance people, and a few of "the public," meaning flag-wavers of the type of Lord Brabazon of Tara.

In the U. S. we consider that certification is a government responsibility. Britain considers it otherwise, which is its right, but one can only conclude that our standards are likely to be higher in this country where safety precedes the waving of the flag.

There have been a lot of hints that under the terms of the contract signed between Pan American World Airways and de Havilland for three Comet III's, with option for seven more, CAA certification must be assured by April 30, 1953, or the contract is void.

In view of the fact that the CAA could not possibly certificate an airplane that won't be in the air until 1956 at the earliest, this provision is either utterly silly or doesn't exist. For Lord Brabazon to make statements that the U. S. had "rejected" an airworthiness certificate when no request for such certificate has been made—and can't be made without an airplane—is either intentionally frivolous or the advance build-up of an alibi.

Praise for Gilpatric

The aviation press, including this magazine, has often been negligent in giving praise where praise is due. Such has been the case with Roswell L. Gilpatric, who served as Under Secretary of the Air Force until the new Administration came into office several months ago. Although he was urged to remain for at least six months, Gilpatric decided to return to his New York law firm.

Here wasn't exactly an unsung hero, but he never received the full public credit he deserved for doing an outstanding job in the Air Force in the face of vast obstacles. Industry trusted and liked him. He listened to industry problems, in contrast to the brush-off so often given to industry by top uniformed brass. He did his best and asked nothing in the way of glory in return. Belated as this is, we want to go on record in praise of a good American who did much for this country's air power.

Another good man, who did consent to remain for six months or so, is John F. Floberg, Assistant Secretary of the Navy for Air. Here is another executive with a sensible, rational approach to the rather overwhelming problems connected with defense build-up. Good Air Force and Navy teams are now in the saddle, but we shouldn't forget the men who stuck it out under conditions which were something less than ideal.

Signs of the Times

Bombers are getting so big and airframe structures so thick that Bill Allen, president of Boeing Airplane Co., now refers to his outfit as the Boeing Airplane and Bridge Company.

. . . WAYNE W. PARRISH

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Industry Spotlight

BUREAU of Aeronautics decision on the winner of a design competition for a new carrier-based day fighter is due momentarily. At least seven companies made a total of about 18 entries, including Chance Vought, Temco, Grumman, McDonnell, Douglas, Lockheed, and North American.

•

Number of airlines which have not yet purchased ignition analyzers diminished when Braniff Airways bought 12 Bendix-Scintilla models for about $30,000. Braniff will follow American Airlines' example, using them as portable airborne units until maintenance personnel are convinced of their value, then installing them as airborne equipment.

•

First of the USAF's 17 forging and extrusion presses under the $389 million heavy press program has been installed at Aluminum Company of America's Lafayette, Ind., plant and is expected to be turning out extrusions by summer. The 14,000 tonner was built by Schloemann at Dusseldorf, Germany.

•

American Machine & Foundry Co.'s electronics division at Boston now has $40 million in USAF orders for electronic trainers to simulate bombardier and navigator problems. First one is destined for the Air Materiel Command at Dayton. Regular deliveries to USAF bases at the rate of three or four a month begin in July.

•

USAF has approved a dual-procurement program so that airframe companies can order both forged and extruded and conventionally machined parts during the transition period when its heavy presses get into production later this year and next. The move is designed to make certain no aircraft projects are held up if deliveries of the aircraft forgings are delayed.

•

Despite a Navy cancellation of 100 F10F Jaguars, Grumman appears to have about a two-year backlog of F9F-6 Cougars alone. About 250 of the 1,000 swept-wing Cougars on order have been built.

•

Five Pratt & Whitney-licensed R-4360-63 engines built by Ford Motor Co. at Chicago failed performance tests at the plant in a two-week period. The engine is used in the C-124C Douglas Globemaster. FBI officials are investigating possible sabotage.

•

Boeing's 707 jet transport apparently will be a larger airplane than had been anticipated. Reports indicate it will carry 80 passengers in a plush version, 100 in normal operations, and 130 when used for tourist services.

•

Spartan Aircraft Co. won the first major maintenance contract to be awarded by the Army—maintenance of liaison planes and helicopters at Fort Sill, Okla. First contract for $300,000 was a starter.

•

Piasecki holds an Air Force development contract for a turbine-powered version of its XH-16 40-passenger troop transport helicopter. The turbine model is designated the YH-16A.

•

New cross-wind landing gear developed by Boeing is being tested on a B-47 at the company's Wichita plant. This marks the first time the cross-wind gear principal has been tested on jets; previous experiments were run on a T-6 and DC-3.

■

Bendix-designed nose-steering system has been ordered into production for the Beech T-36A twin-engine trainer and is also undergoing tests on a Boeing B-50. Proving tests were made on Bendix Products Division's B-25.

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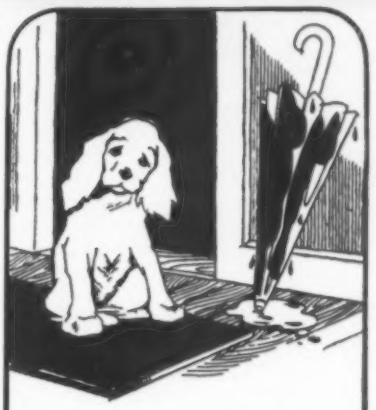

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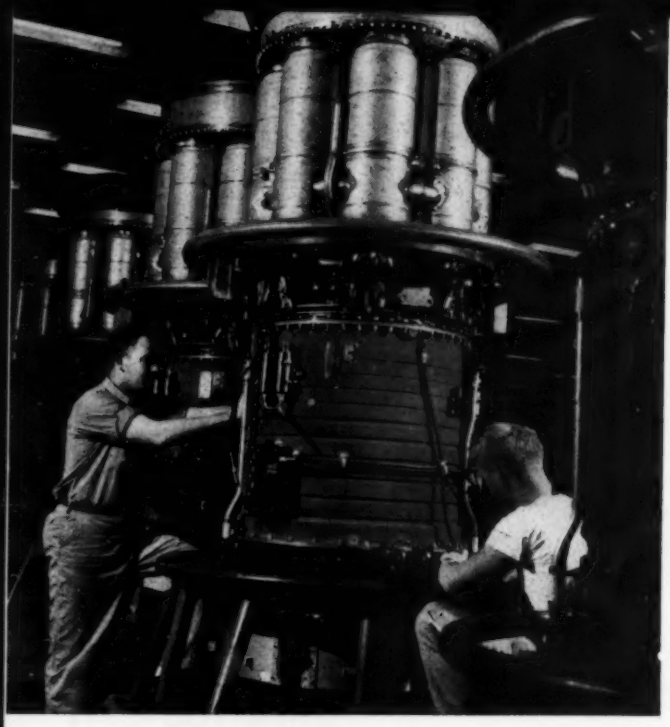

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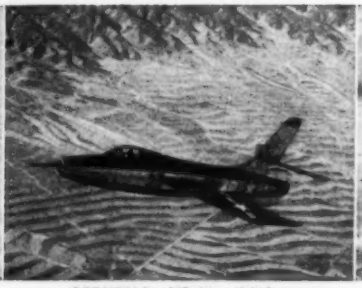
NORTH AMERICAN F-86, outscoring MIG in Korea

NORTH AMERICAN B-45 operational jet bomber

MARTIN XB-51, experimental tactical bomber



REPUBLIC XF-91, high-speed interceptor

CONVAIR B-36, intercontinental bomber

NORTH AMERICAN FJ-2, new Navy fighter

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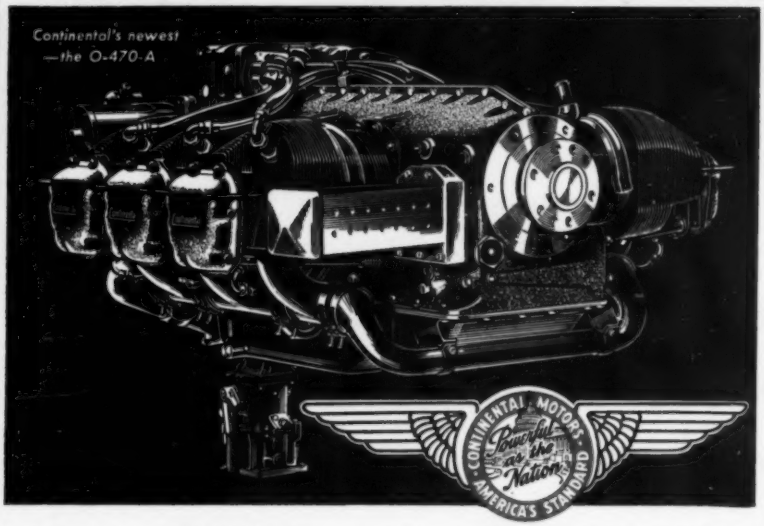

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This great new Continental—the O-470-A—strikes an unusual balance among the factors that spell utility in a plane.

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There's POWER for sparkling all-round performance—225 h.p. @ 2600 r.p.m.

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The O-470-A, in short, is engineered and built to lengthen the longstanding leadership of Continental aircraft power.

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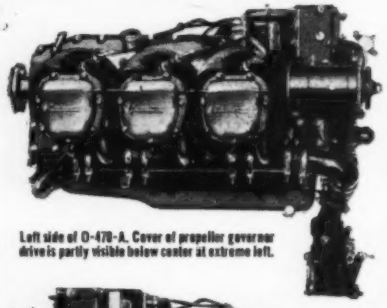
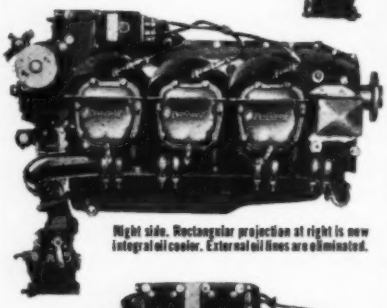
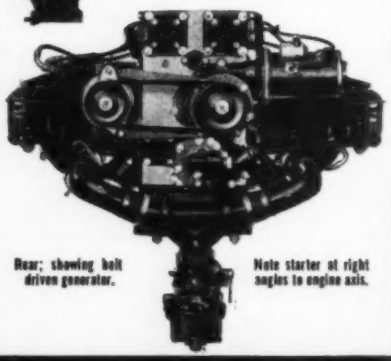


Left side of O-470-A. Cover of propeller governor drive is partly visible below cooler at extreme left.



Right side. Rectangular projection at right is new integral oil cooler. External oil lines are eliminated.



Rear; showing belt driven generator.

Note starter at right angles to engine axis.

Continental Motors Corporation
Aircraft Engine Division
MUSKEGON, MICHIGAN

Letters

Letters should be addressed to The Editor, American Aviation Magazine, 1025 Vermont Ave., N.W., Washington 5, D. C. Anonymous letters will not be printed, but names will be withheld upon request.

CRUSADE

To The Editor:

A recent issue (March 16) of your magazine has an article which should provide much comment throughout the industry. I have in reference the paper prepared by Bennie Howard. You and your magazine deserve a lot of praise for having the courage to bring before the industry such forthright truth. Whether or not Mr. Howard has written his one way ticket out of the aviation industry remains to be seen; however I for one say he deserves great recognition for his crusade for safety.

Along with the many fine and diversified coverages given in your publication, I believe you have a nucleus for presenting and stressing "Safety." Let's keep the industry reminded in said respect.

HIDEO YOSHIZATO
Colonial Airlines
New York

AOPA & MID-AIR COLLISIONS

To the Editor:

Just a few comments on a couple of your recent editorials in AMERICAN AVIATION. First, as to AOPA's objections to the inauguration fly-over. I for one thought they were well taken. The flight as planned certainly was wide open for an accident, and if there had been one it would have given aviation a black eye far out of proportion to the good obtained if there had not been one.

In addition, the darned jets flying over would have been a cussed nuisance during the parade. I think they could have had some aerial participation higher and farther away than originally planned, but that was apparently decided against, which certainly wasn't AOPA's fault.

Second, on the collision angle, while certainly some fault usually lies on both sides in either an auto or a plane collision, I feel AOPA has a definite point. Unfortunately the public always seems to assume that the private plane is automatically at fault, a conclusion frequently helped along by the press. In the only accident I know anything about at first hand (I talked to the co-pilot) involving Pan American's Constellation and a Cessna 140 over Long Island Sound, in my opinion the greater fault definitely lay with the airline pilots although CAB blamed both parties.

The plain fact is that the visibility from airliners leaves much to be desired; in addition any honest airline captain will tell you that they don't look out any too much, especially when they are away from the immediate vicinity of a terminal airport. Many times they are doing paper work, and TWA used to do under-the-hood time on scheduled flights; the hood they used

(Continued on p. 73)

SIMPLICITY in hydraulic pump design is important for these reasons:

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. . . volumetric efficiencies up to 97% over a wide range of temperatures

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B.F.Goodrich

First Tubeless Tire for combat jets gives safer high-speed take-offs, landings

Proved in flight tests on Navy's Grumman Cougar

B. F. GOODRICH announces a new aeronautical advance—the world's first tubeless airplane tire for military jets. It's designed to give safer high-speed landings and take-offs, cut weight, simplify assembly and maintenance.

Like the famous B. F. Goodrich Tubeless Tire for passenger cars, introduced five years ago, the new airplane tire has a patented inner lining that's part of the tire itself. There's no tube to go flat —no tube to bunch up or shift during landings and take-offs.

Because the inner tube is eliminated, the new BFG tubeless airplane tire reduces overall weight of aircraft. Instead of the conventional unit of tire and matching tube, there's only one unit to assemble and mount. Only one unit to warehouse, too. In addition, there's less checking of inflation pressure because the special lining retains air much longer than conventional tubes. Loss of air around the rim is prevented by ridges molded on the outer side of the tire.

The new BFG tubeless airplane tire has passed the most severe laboratory tests, including a special "bottoming" test specified by the Navy. It showed the tire retains air even though compressed flat to the rim! The tire went on to pass its flight tests on the Grumman Cougar, new Navy jet fighter.

Another B. F. Goodrich first in aviation, the new high pressure tubeless tire for combat jets is the latest example of BFG's leadership in rubber research and engineering.

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ESTABLISHED JUNE 1, 1937

World's Largest Aviation Publishers
American Aviation

VOLUME 16, NO. 25

Sixteen Years of Building Aircraft

Twelve Major Airframe Companies, 1937-1952

Year	Net Sales (millions)	Net Profits (millions)	Current Assets (millions)	Current Liabilities (millions)	Net Working Capital (millions)	Total Liabilities (millions)	Inventory (millions)	Net Plant (millions)	Net Worth (millions)	Federal Tax (Percent of Total Income)	Net Profits (Percent of Net Sales)	Average* Earnings Per Share	Return on Stockholders Investment	Current Ratio	Acid Test Ratio	Liquidity Ratio	Debt Ownership Ratio	Inventory Turnover (times)	Net Working Capital Turnover (times)
1952	$3731.1	$81.7	$1251.2	$942.8	$308.4	$1428.4	$531.0	$154.0	$447.6	62.9%	2.2%	$3.98	$0.183	1.3	.74	17.7	3.19	7.0	12.1
1951	1979.3	30.9[a]	914.9	640.4	274.5	1061.8	373.4	124.4	388.4	68.6	1.6	1.68	0.080	1.4	.74	18.4	2.73	5.3	7.2
1950	1388.3	62.6	574.5	286.8	287.7	681.4	208.3	82.8	380.0	43.7	4.5	3.85	0.164	2.0	1.26	23.3	1.79	6.8	4.8
1949	1131.7	36.1	541.4	285.8	255.6	634.2	225.2	69.3	333.9	37.5	3.2	2.37	0.108	1.9	1.08	26.8	1.90	5.0	4.4
1948	843.4	2.4	524.7	279.9	244.8	621.0	210.3	70.1	317.7	82.3	0.3	0.16	0.008	1.9	1.11	23.9	1.95	4.0	3.4
1947	545.0	(41.9)	534.8	283.5	251.3	638.1	293.8	74.0	366.7	n.a.	(7.7)	(3.09)	nil	1.9	.83	18.9	1.74	1.8	2.2
1946	519.0	(10.7)	540.7	229.1	311.6	630.2	237.1	48.8	383.4	n.a.	(2.1)	(0.80)	nil	2.4	1.32	32.9	1.64	2.2	1.7
1945	3965.3	67.4	958.6	592.3	366.3	1021.3	130.9	27.4	423.8	57.5	1.6	5.08	0.159	1.6	1.34	34.1	2.41	30.3	10.8
1944	5766.3	58.6	1460.4	1235.4	225.0	1627.5	331.8	69.9	384.8	71.7	1.0	4.71	0.152	1.2	.91	26.7	4.23	17.4	25.6
1943	5209.0	72.8	1703.4	1444.6	258.8	1882.9	434.2	103.7	326.4	72.0	1.4	5.87	0.223	1.2	.87	24.7	5.77	12.0	20.1
1942	2788.9	60.6	1256.9	1133.9	123.0	1409.4	424.3	92.6	246.3	72.6	2.2	5.63	0.246	1.1	.73	24.4	5.72	6.6	22.7
1941	812.6	60.1	662.3	582.0	80.3	806.1	346.7	110.3	159.2	59.5	7.4	4.86	0.377	1.1	.54	19.8	5.06	2.3	10.1
1940	247.4	31.8	397.8	331.8	66.0	471.1	142.2	54.5	91.8	26.9	12.9	2.72	0.346	1.2	.70	45.8	5.13	1.7	3.7
1939	141.0	14.6	97.4	59.8	37.6	131.2	47.6	23.4	69.1	19.7	10.3	1.45	0.211	1.6	.83	37.9	1.90	3.0	3.8
1938	88.5	8.0	48.8	17.9	30.9	74.0	16.5	16.7	54.3	21.5	9.1	0.90	0.148	2.7	1.78	35.1	1.36	5.4	2.9
1937	61.8	2.3	42.7	21.3	21.4	65.7	15.0	15.3	43.0	26.9	3.7	0.26	0.053	2.0	1.29	17.6	1.53	4.1	2.9

On the basis of weighted averages.
[a] Reflects $22.2 million dollar loss by The Glenn L. Martin Co.

SOURCE: AIA and American Aviation *compilations from Moody's Industrial Manuals and individual company reports.*

Manufacturers Wary Despite '52 Net

Continued low earnings on sales, record inventories, and stretchouts overshadow $81.7 million profit.

By Philip A. Fitzsimons

THE AIRCRAFT industry's net earnings on sales continues to be kept considerably below those of comparable industries as well as the manufacturing industry as a whole. One of the principal determinants has long been the military's unilateral control of profits through stringent contract price redeterminations. Since monies recovered through such price redeterminations revert to the services for further procurement, this operation seems to have been one of profit margin reduction.

Despite this condition, aircraft builders have completed one of their most productive years, and earned their largest dollar profit in history, $81.7 million.

At first glance one sees several factors which make the outlook for 1953-1954 look bright:

• **Sales up $1.8 billion dollars,** yet financed by only $33.9 million increase in working capital. This more efficient use of the industry's working capital is shown by an increase in its turnover from 7.2 times in 1951 to 12.1 times in 1952.

• **Net profit on sales** increase over 1951 points up more efficient business management.

• **Earnings on investment capital** increased from 8.0¢ on the dollar in 1951 to 18.3¢ in 1952. This represents an average earnings-per-share increase from $1.68 to $3.98.

Despite these encouraging signs, industry leaders and financial houses are keeping a wary eye on the situation.

Major threat on the immediate horizon is the matter of cut-backs and stretch-outs currently being undertaken by the Defense Department, the customer which accounted for approxiately 95% of the industry's sales last year.

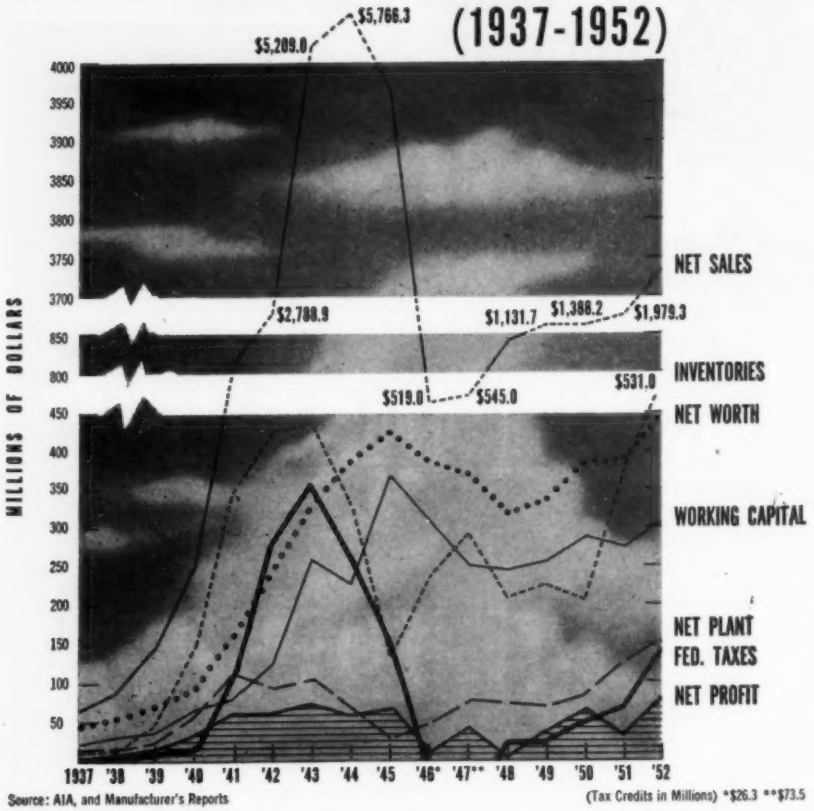
With the tax bite up from $68 million to $138.8 million, a total of 62.9% of total income before taxes, it is clear that the industry will be helped a great deal if and when excess profits taxes are allowed to lapse. The resulting benefit might well be diluted, however, by stiff programs of contract price redetermination by the armed services, and tax renegotiation by the Federal government designed to minimize the increase in profits.

Some of the factors which are worrying industry leaders:

• **The industry's financial inadequacy** at year-end to meet its present debts (current liabilities). It is in the worst shape it has been in since 1937, as is evident when the amount of money it can put its hands on (net quick assets) is compared to its current obligations. Last year also marked the lowest percentage of cash and securities in current assets since 1937.

• **Inventories at a record high** of $531 million dollars were up 42% over 1951. Exceeding net working capital by 172.2% and stockholders' investment (net worth) by 118.6%, the financial risks increased and working and invest-

FINANCIAL PROFILE of the AIRCRAFT INDUSTRY (1937-1952)



COMPREHENSIVE GRAPH shows inventories climbing fast.

ment capital became more vulnerable to inventory losses.

• **Creditors owned 3.19 times as much** of the industry's business assets at year-end as did its stockholders. This is the highest debt ownership since 1944.

• **With investment in company-owned plant** and equipment at its all-time high of $154 million dollars—up 24% from 1951 and approximately 40% greater than the highest World War II years—the aircraft industry continues to "push" its reasonable limits. Additional plant expansion in the coming period of declining production demands would almost surely invite financial embarrassment.

Of great interest is the latest record of operations. Figures of the 12 largest aircraft manufacturers (by sales), who accounted for over 90% of total airframe weight produced in 1952, were recently analyzed. From them it can be seen how the aircraft industry is actually doing, and barring a recession in 1953 or 1954 they offer the best guide to its future.

The alpha and omega of the free enterprise economy has long been increased sales, with the resulting increased profits. Last year sales went up 88.5% and net earnings increased 26.4%, to their all-time high of $81.7 million dollars. The number of cents profit after taxes for each dollar of sales (margin of profit ratio of net profit to net sales) increased last year to 2.2%, from 1.6% in 1951.

These earnings are an indication of operating management's increased efficiency in that period. However, since a great portion of income from military contracts is subject to price redetermination, these figures are only tentative.

The management has continued to provide adequate working capital from stockholders' investment by keeping it sufficiently greater than the investment in plant and equipment. Efficiency of net working capital use was increased last year by increasing its turnover (ratio of net sales to net working capital) from 7.2 times in 1951 to 12.1 times. The Industry Planning Service of the Aircraft Industries Association states in its 1952 review of the financial situation of the aircraft manufacturing industry: "The improved turnover rate is primarily the result of a reduction in the average collection period for accounts receivable from 67 days in 1951 to 47 days at the close of 1952. This increased efficiency in the use of working capital funds was largely responsible for the industry's ability to finance the expansion of approximately 1.8 billion in sales . . ."

Business managements have learned, however, that there is a proper balance between the income and outgo of funds which must be maintained during an expansion process. Without sufficient net working capital, net worth, and a healthy collection period, expanded sales volumes can easily disturb this balance.

Usually compared to measures of business management efficiency is a measure of the percentage return on stockholder's investment. This is the relationship of earnings after taxes (net profit) to stockholders' investment (net worth).

Net Profit to Sales, %

Industry	1952	1951	1950	1944	1943
All Mfg.	5.4	6.2	7.7	3.3	3.6
AIRCRAFT and PARTS	2.4	2.2	4.5	1.2	1.8
Nonferrous Metals	7.7	8.8	9.8	8.6	9.0
Autos & Trucks	5.5	5.2	8.9	3.1	3.2
Railway Equip.	3.8	4.8	5.5	3.1	3.1
Iron & Steel ..	5.0	5.8	8.1	2.6	2.8
Petroleum Products ...	10.5	11.5	10.8	7.0	6.8

Source: National City Bank of New York, "Economic Conditions," April of each year.

Earnings Rise

If we omit the Glenn L. Martin Co. from the group for both years (it lost $22.2 million dollars in 1951, yet earned $5.8 million last year), the picture changes somewhat, but the trend remains the same. Last year's earnings would be 17.4¢ for each invested dollar, as compared with 13.7¢ in 1951.

This rising trend in earnings on investment capital is due partly to increased operating efficiency, but also to increases in prices and profit margins during the year.

While aircraft stocks remain speculative because of cut-back threats, it appears likely that existing heavy backlogs should permit higher sales with as good or better earnings during the coming year.

The key question is: "Is the industry in a satisfactory liquid position?" As noted above, the percentage of cash and securities in current assets is the lowest since 1937. Also, the current ratio (current assets to current liabilities) has declined.

With current assets being made up of elements of varying convertibility, the desirable current ratio for a specific industry is difficult to determine. However, the current ratio generally answers the question of whether a firm or industry could retire its current obligations within the year with relative ease and still be able to expand its volume should business demands increase or opportunities present themselves. The actual dol-

lars which determine this ability are the net working capital (often called net current assets). Financial analysts agree today that an industry's current ratio often can be safely below the widely accepted "Two-for-one" level.

It can generally be said, however, that such lower current ratios are only safe if inventories are small or readily convertible into cash with little loss, accounts receivable are easily collectible, and relatively little of the industry's products are sold on credit. The aircraft manufacturing industry does not rate the "safe" current ratio label because of its present inventory position.

Another guide to the industry's financial adequacy is the "acid test" ratio of net quick assets (i. e., cash, current receivables, and marketable securities) to current debt, which eliminates from interpretation the variables in current assets. This then is admittedly a rigorous but important test of the industry's ability to meet its current obligations. Analysts generally consider businesses to be in a satisfactory liquid position when this ratio is one. The industry was in a good liquid position in 1950 with a ratio of 1.26. At year end 1951 and 1952 the ratio was .74, leaving it in a much less enviable credit position.

A business should avoid excessive inventories just as it avoids excessive liabilities or overly large investments in fixed assets. Industries have often experienced heavy losses in depreciation and obsolescence due to excessive inventories. The threat of these loss causes to the aircraft manufacturing industry is, needless to say, a very real one.

Establishing a yardstick for proper inventory size is difficult. One financial analyst will use the guidepost of inventory to net working capital; another will state that inventories are large or small only in terms of the yearly turnover. The latter measure is hardly applicable to the aircraft manufacturing industry, however, due to its vulnerability to cancellations.

The industry did increase its inventory turnover, however, from 5.3 in 1951 to 7.0 in 1952. This means that the industry made seven dollars in sales, in 1952, for every dollar invested in the inventory, as compared with the previous year's $5.30.

This increase in inventory turnover is the industry's favor. However, it is far short of increasing in proportion to increase in net sales, an increase of as against 88.5%. When net sales rose 86.8% in 1943 over 1942, the inventory turnover increase was roughly proportional at 82.5%. Inventories had increased only 2.3% in that year.

Inventories were 172.2% of net working capital in 1952 and 136% in 1951, as compared with 72.4% in 1950. When inventories reach the level of and exceed net working capital, management staffs should thoroughly investigate their efficiency in purchasing, handling, and selling their product. The past two years have called for such action.

Roy A. Foulke, vice president of Dun & Bradstreet, Inc., writes that management staffs should limit the investment in fixed assets to an approximate maximum of 75% of the tangible net worth. With net fixed assets (company-owned plant) at an all-time high in 1952, it should have been gratifying to the investing stockholders that only 34.5% of their investment was tied up in fixed assets, since it is more desirable to have working capital available from owner's equity than from debts to creditors.

Although the working capital may appear adequate, the stockholders are equally interested in the relative ownership of the business by themselves and creditors, a relationship revealed by the ratio of total liabilities to net worth. Since the aircraft industry acquires most of its business assets by borrowing from creditors, it is not surprising to find 1938 with the highest ratio of proprietor ownership.

In the boom year of 1943, the year of highest debt ownership of business assets in the industry's history, creditor's claims were 5.76 times as large as the stockholders' investment. In 1952 the debt ownership was 3.19 times greater than stockholders' investment.

It may be very profitable for the industry to be financed by creditors rather than stockholders, but it is also quite dangerous. In the event of substantial contract losses due to cancellations, cut backs, or stretch-outs the monthly payments and interest on this large debt might become a burden too great to be carried. In the absence of such recession for the industry, 1953 might well be a year of even higher sales and profits. The fact remains, however, the financial storm warnings are out in full. • • •

Attack version of the Cutlass, to be known as the A2U, will be built by Chance Vought, according to a letter of intent received from the Navy. A swept-wing shipboard fighter version of the plane is now in production as the F7U-3.

Actions Settle Top CAA, CAB Posts

The White House and Congress acted late last month to clear up the muddled situation involving top spots in the CAB and CAA with these actions:

- **Appointed Oswald Ryan** as chairman of CAB for 1953, thus affirming an earlier appointment made by Former President Truman.
- **Appointed Harmar D. Denny** as vice-chairman, thus filling a spot that has been vacant since November 1, 1952.
- **Approved the nomination** of Fred B. Lee as Civil Aeronautics Administrator.

The first two were White House actions; the last a Congressional move. In the case of the CAB, President Eisenhower departed from tradition by naming two from the same party to hold the chairmanship and vice-chairmanship.

Closing of Delta-C&S Merger Due Soon

Consummation of the merger of Chicago & Southern Air Lines into Delta Air Lines came on May 1 following an overwhelming stockholders' vote in favor of the deal. CAB approved the agreement last December 31 and has issued a new certificate to the merged firm.

Delta's stockholders, meeting in Atlanta, voted 561,163½ to 76½ in favor of the merger. At Memphis, C&S's shareholders supported the deal by voting 448,658 for and 5,996 against.

The companies held a "closing meeting" on May 1 to work out final legal details. A new board of directors was set up, including Delta's present 10 members and three C&S representatives.

Trend of Air Fares

Compared to Rail Coach, Rail Parlor Car and Bus Fares

	Air Passenger Revenue		Rail Coach Passenger Revenue		Rail Parlor Car Passenger Revenue		Bus [1] Passenger Revenue	
	Per Passenger Mile	Index	Per Passenger Mile	Index	Per Passenger Mile	Index	Per Passenger Mile	Index
1939	5.10	100.0	1.80	100.0	2.33	100.0	1.50	100.0
1946	4.62	90.6	1.82	101.1	2.45	105.2	1.62	108.0
1947	5.04	98.8	2.02	112.2	2.74	117.6	1.64	109.3
1948	5.75	112.7	2.29	127.2	3.01	129.2	1.68	112.0
1949	5.76	112.9	2.41	133.9	3.14	134.8	1.79	119.3
1950	5.54	108.6	2.47	137.2	3.25	139.4	1.85	123.3
1951	5.59	109.6	2.47	137.2	3.27	140.3	1.90	126.7
1952 [2]	5.55	108.8	2.51	139.4	3.34	143.3	N.A. [3]	N.A. [3]

[1] *Greyhound System*
[2] *12 months to September 30, 1952.*
[3] *N.A.—Not available.*

Source: Recurrent Reports of Financial Data, CAB Statement R-250, Interstate Commerce Commission Annual Report, 1951, Greyhound.

FARES OF TRUNK LINES started the case; local routes may finish it.

Should Trunks Share Local Service Routes?

Demands for subsidy cuts may bring CAB investigation of whether big lines should serve some feeder points.

By WILLIAM V. HENZEY

WHAT STARTED out to be a general investigation and possibly an overall reduction of domestic trunk airline passenger fares, may well give way to a general investigation of the local service airline industry, under the force of Congressional demands for reduction in airline subsidies and a squeamish attitude on the part of CAB with respect to proper distribution of airline profits.

This seemingly strange evolution from a trunk-line fare case to a local service route study can be attributed to (1) current trunk-line profits, (2) high local service line subsidies, and (3) a Congressional proposal to use the trunks' profits to offset the local carriers' subsidies.

Behind this particular development, one of many advanced for the utilization of airline profits, is Senator Edwin C. Johnson (D., Colo.), former chairman of the Senate Interstate and Foreign Commerce Committee, who recently intervened in the behind-the-scenes maneuvering at CAB with respect to trunk-lines' requests for dismissal of the pending fare investigation.

Johnson strongly opposed, in a letter to CAB Chairman Oswald Ryan, any investigation which might result in reduction of the current fare structure. But, to utilize "the very fortunate current profits of the larger airlines," he suggested that CAB give consideration to transferring "subsidized localities" from local service and small trunk lines to the larger trunk carriers.

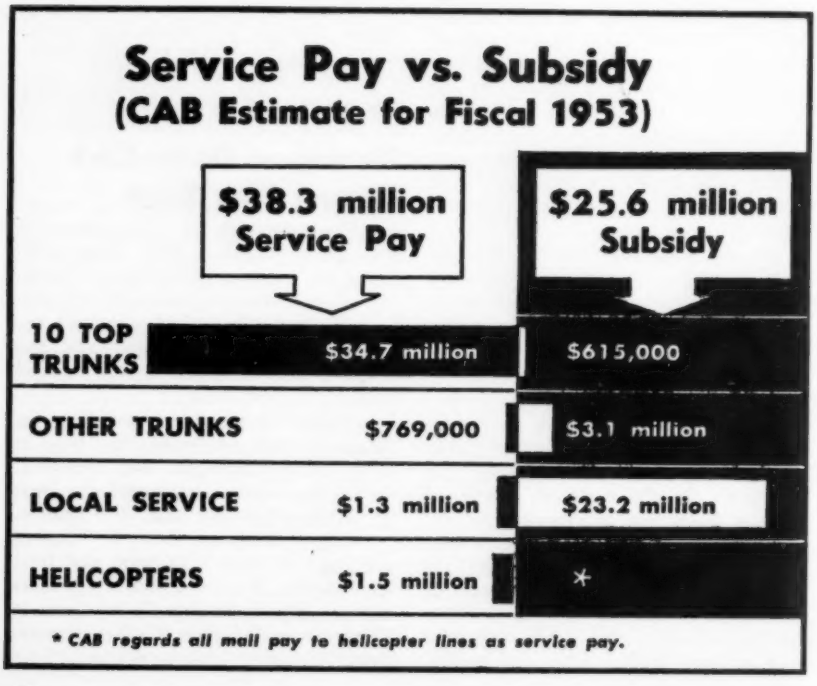
He based his plan on:

- **A study conducted** in connection with proposed subsidy separation legislation last year, which was interpreted to show that cities and not airlines actually are being subsidized;
- **Developments in the railroad field,** where the big lines were compelled to operate branchline passenger service, at what Johnson termed "a terrific loss."

Thus, the Senator said in his letter to CAB, instead of reducing the rates of the "strong air carriers," the carriers should be required to take the bitter with the sweet, as have the railroads, and thereby relieve the Treasury of domestic airline subsidy.

As indicated in table at left, the annual subsidy bill is estimated at $25,621,000 for the domestic lines in fiscal 1953. Only a fraction of this, however, is received by the top 10 trunk airlines, with the smaller trunks and local service receiving all but $615,000.

In light of this situation and Senator Johnson's proposal, CAB is giving



LOCAL LINES get lion's share of subsidy pay, analysis shows.

serious thought to an investigation which involves the entire philosophy behind a second-level air transport system. It could mean reversing present policy completely by parceling out feeder points, or even route segments, to the more profitable trunk carriers.

Neither the trunk nor local service industry has indicated support for this plan, although some top airline officials feel a development along those lines is inevitable. At CAB, Chairman Ryan is said to be studying the ramifications of such an investigation. Member Josh Lee, on the other hand, is opposed to reversing the present policy.

The other Board members are question marks at this point. Current policy was started several years ago and calls for temporary or permanent transfer of so-called "marginal" stops from trunks to local lines. For the trunks, it has been regarded as a "streamlining" policy; for the local lines, a "route-strengthening."

Argument Springboard

The trunk industry, according to an official of the Air Transport Association, looks at Johnson's proposal as another suggestion for utilizing profits short of honoring airline management's discretion. The controversial fare case has been perhaps the most prominent springboard for arguments pro and con on what to do with profits that may be considered "excessive."

In urging CAB to drop its fare investigation, airlines contend that profits are not excessive when measured by proper "yard-sticks" and should be utilized to achieve earnings stability for the benefit of investors.

For this reason, with two CAB members, Lee and Joseph P. Adams, pushing for the fare investigation, that case has become the hub of the airlines' economic future.

At press-time CAB had not yet decided officially to continue or drop the investigation. A preliminary vote of Board members taken in mid-April would have, if made official, continued the investigation against the airlines' wishes.

But much further study was given to the serious problem by the Board and informed sources indicate the vote may be completely reversed when it is officially taken. This would mean the danger to the fare structure would be eliminated. But if the Johnson proposal for caring for local lines' current ills with trunklines' current profits is the outcome, there are trunklines that feel their plight may only be intensified.

As for the local industry, a spokesman for that group said a policy reversal as contemplated by the Senator would be "damaging" and "set us back many years."

Furthermore, it was pointed out, the public would suffer. He indicated the trunks, with their trend to larger and faster equipment, could not give the quality of service now offered by local lines without substantially increasing their costs, possibly to the point of needing subsidy once again.

This official emphasized that several local carriers have made substantial strides toward self-sufficiency, but the ultimate achievement of this goal depends on the manufacture of a plane which can be operated economically over the short-hop routes assigned by CAB.

If, therefore, they are forced to give up points, or even whole segments, the feeling is that the full benefits will not be realized from the subsidy that has been spent thus far. In short, both sides generally look at the Johnson proposal as a false economy move if put into motion. Both the trunks and local carriers decry the ultimate effect on incentive that any airtight transfer policy may have.

But not to be minimized is the clamor in Congress for overall economy, with the reduction in airline subsidies as one major phase of the push. As Johnson put it to CAB: "I expect the Administration and the Congress to insist upon an immediate substantial subsidy reduction."

• • •

News Briefs

Special assistant to Air Force Secretary Talbott on research and development matters will be **Trevor Gardner,** president of Hycon Manufacturing Co., of Pasadena.

• •

Twenty-three years without a fatality or even a serious injury to a passenger or crew member is the record for **Colonial Airlines,** as of April 18.

• •

Airborne distance measuring equipment is being installed by Bendix Radio Communications Division in its Beechcraft for tests and demonstrations. The equipment will be used in conjunction with a visual omnirange system.

• •

Preliminary reports for the quarter ended February 28 show **Pacific Airmotive Corp.** with a net loss of about $78,000, but price revision claims are not included in this summing up. Such claims may exceed $100,000, to PAC's advantage. Sales for the quarter were $4.8 million, down from $6.8 million for the similar period the previous year.

• •

Shift in control of Cubana (Compania Cubana de Aviacion) came as Pan American sold its controlling interest to a group of Cuban financiers, headed by Havana banker Eusebio Delphin.

• •

First flight has been successful for the first production model of the **Chase C-123B,** which took to the air for 50 minutes from the West Trenton, N. J. plant.

• •

Purchase of another DC-6B has been approved by the directors of **Western Air Lines,** bringing the total on order to four; five of the aircraft are now flying for WAL. Introduction of the equipment into service this spring contributed to the **heaviest March passenger traffic** in the carrier's history, and an all-time high in first-quarter revenues, which an estimated $5.1 million, up 28% over 1952's figure.

• •

Production of Lockheed's **P2V patrol bomber** is being stepped up for deliveries to "additional" NATO countries; England and Australia operate the aircraft at present. Work on a new model, probably to be the P2V-7, is now under way at Lockheed.

• •

The NACA wanted $8.5 million for land and construction work on a rocket engine research facility at the Lewis Flight Propulsion Laboratory, Cleveland, O. When the **House Armed Services Committee** got through pondering the request it allowed an appropriation of 10 (ten) dollars, which the NACA could splurge on the acquisition of land, not to exceed 10 (ten) acres.

• •

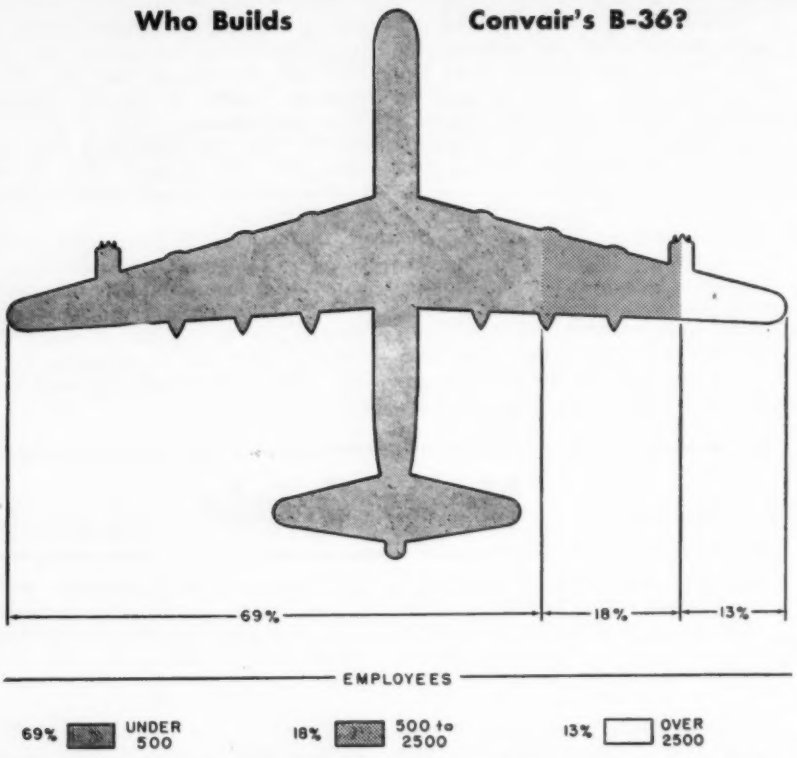
Fifteen thousand passenger seats are on the backlog of the **Hardman Tool & Engineering Co.** The firm has over $4 million in total backlog, 80% of which represents passenger seats.

• •

An increase of **112% in operating revenues** was achieved last year by **Pacific Northern Airlines,** which gathered in more than $5 million. After an increase of 89% in operating expenses and payment of taxes, about $238,183 was left. PNA's plan for '53: a $2 million expansion program.

• •

Fifty Boeing C-97 Stratofreighters will be modified by **Temco Aircraft Corp.** for use in air evacuation. Temco is also modifying **two Lockheed Constellations** for Pan Am, converting them to 70-passenger interiors.



TYPICAL OF THE FARMING-OUT of aircraft production work to small business concerns is Consolidated Vultee's use of companies with fewer than 500 workers for its B-36 bomber. The company's Fort Worth Division says more than 1,500 of its 2,200 subcontractors and suppliers (about 69% of the total) are small businessmen.

Cut-backs to Hit Small Suppliers Hard

When production base shrinks, prime contractors will start doing the jobs now given to small firms.

By Robert M. Loebelson

THE NEW TEAM running the Defense Department, having undertaken a "complete review" of the mobilization program established under former President Truman, has decided that the U.S. is "paying dearly" for some of the "fantastic" planning made before and after Korea.

To try to remedy the situation, Defense Secretary Charles E. Wilson and his deputy, Roger M. Kyes, have decided that since too many plants are now turning out aircraft and other defense materiel under the base-broadening program, the inefficient and high-cost producers will be eliminated (American Aviation, March 16).

This decision was revealed by Kyes recently. He declared, however, that "careful consideration" would be given to certain vital industries which do not have full opportunity in a civilian economy, and noted that "the aircraft industry is an example of this type."

Thus it is apparent that most of the cutbacks and cancellation of second sources will affect primarily automobile companies which were asked to turn out engines and complete aircraft after the Korean war began. Some of this second source work may revert back to the prime company, but it is more probable that most of it will be completely canceled.

At a recent press conference, President Eisenhower was asked about a stretch-out of the European defense goals. The President replied that anyone who based his defense planning on a possible enemy attack at a given date was crazy and did not make sense.

If Mr. Eisenhower's comment can be interpreted to mean that he feels the same way about U.S. mobilization, it is logical to expect a stretch-out of present goals beyond the beginning of 1956. The 143-wing goal for the USAF and the 16 carrier air groups for the Navy were both based on the conclusion of the Joint Chiefs of Staff that this country's maximum danger from Russia was expected in mid-1954. The January, 1952, stretch-out ordered by the Truman administration changed the target dates to the end of 1955 and possibly the middle of 1956.

But if the President is convinced that such a target date is meaningless, a new stretch-out will develop and the present goals might well be moved into 1957 and possibly later.

The Air Force, which had formulated plans to help stabilize the aircraft industry by giving it most of the aircraft maintenance work after the plane production peak had been passed, may have to move such a program up by a year or two. In the meanwhile, most of the aviation companies have given much thought to the possibility of a new stretchout and have reached a virtually unanimous conclusion.

When the word comes that delivery dates to attain the 126 combat and 17 carrier wings have been moved farther into the future, the aircraft industry has decided that it will call in a good part of the work now handled by subcontractors and do the construction itself.

At present, virtually every aircraft company obtains between 40% and 50% of its material, parts, and assemblies from subcontractors, suppliers, and vendors. Most of this money goes to other large companies but, numerically, the aircraft industry uses thousands of small business concerns.

While this is true at the present time, it is equally true that if a stretch-out comes, these same small businesses with fewer than 500 workers will be the first ones to lose their subcontracts from the aviation firms, principally because it is just that type of work that aircraft companies will be able to handle.

It would be rather difficult for an airframe manufacturer to try to produce his own landing gears or tires. Economic necessities would force him to continue to buy such equipment from companies specializing in the field. But the same airframe producer can call back and handle without difficulty various fuselage assemblies, e.g., nose sections, tail sections, wings, etc., which he may now be obtaining from subcontractors.

Thus the new Defense Department policy seems to be shaping up into a pattern whereby:

• **Second and third sources** of production in the aircraft industry will be eliminated unless they are either highly efficient, or are turning out a highly vital aircraft or engine, or are pretty far along on deliveries.

• **Aircraft subcontractors,** especially those in the small business category, will lose almost all of their work so that prime producers will be able to come close to their anticipated sales and profits. • • •

F-94C'S DRAG PARACHUTE shows its 24% porosity in the photo above.

Drag Chute Doubles Tire, Brake Life

Lockheed reports landing distance reduced 40% on F-94C; chute good for 100 landings costs $250.

By FRED S. HUNTER

LOCKHEED Aircraft Corp.'s experience indicates tire and brake life are approximately doubled, under average runway conditions, by 100% utilization of the drag parachute on the F-94C.

Landing distance can be reduced 40% through use of the chute, R. H. (Mike) Moulton, group engineer of the F-94C fuselage group, has reported. At one Air Force service base, 44 consecutive landings were made with one aircraft without the use of brakes except for taxi turns and stopping on the ramp.

Life expectancy of the parachute is approximately 100 landings, while cost of the expendable items, such as the chute, the pilot chute and the deployment bag, is approximately $250.

Because of its high safety and relatively low expense features, Moulton predicts the deceleration parachute will become more and more common in new fighter designs.

As jet performance advances and landing speeds increase, the need for auxiliary means of deceleration becomes more important. Wing thickness, fuel tankage, and weight limitations on landing gear design bring landing wheels of small diameter or narrow tread. Tire life and vulnerability of both types is critical because of high peripheral speeds and spin-up abrasion. Wear on brake installations is also excessive.

Lockheed's development of the chute installation for the F-94C has several interesting aspects. The first model utilized was a FIST type of 11-foot diameter, 24% porosity, and a drag coefficient of 0.49. It was stowed in a Fiberglas compartment built into the tail cone ring directly above the tail pipe.

In consideration of the high temperatures of the jet wake, a 10-foot steel line, made up of three ¼" diameter super flex cables, was attached to the release hook in the storage compartment and to the nylon chute riser. This riser extended 15 feet to the serving at the lower end of the shroud lines. A 24" diameter pilot chute was thrust into the slip-stream by the action of the compartment doors.

Later in the F-94C production model installation the parachute was changed to a 16-foot diameter model with the same 24% porosity and the same 0.49 drag coefficient. Lower porosities were flight tested, but exhibited lateral instabilities.

The riser length was reduced to seven feet and a deployment bag was developed. The deployment bag, Moulton says, proved to be a substantial improvement over packing the chute directly into the Fibreglas compartment.

Five Minute Packing

It provided the advantage of consistent packing practice and also allowed pre-packing of the chute, thus saving on turn-around time. In average packing practice, Moulton says, it is possible to arrange the chute in the deployment bag in five minutes and stow the bag in an aircraft ready for flight in 1½ minutes. The bag weighs only 1½ pounds and causes little increase in weight of the entire system, which is approximately 65 pounds.

The stiff and bulky steel drag line was replaced with a nylon line of the same 10-foot length shielded from the heat by Fiberglas sleeving. Use of nylon reduced whip in the line and also decreased the opening shock load.

The mechanical part of the deployment system works in the following sequence:

• **The pilot pulls the chute operating lanyard** in the cockpit floor. The first lanyard movement locks the hook to the link on the end of the drag line.

• **Further movement of the lanyard** releases the spring bungee loaded doors which snap open, releasing the pilot chute, drawing the deployment bag from the compartment, and starting the opening cycle.

• **After completion of the landing roll** the pilot rotates the lanyard handle 180° and the next movement unlatches the hook in the tail cone, jettisoning the chute.

Keeping the parachute unlocked from the hook until the pilot pulls the lanyard absolutely insures safety in the event the doors should open inadvertently at low speed, such as on take-off, Moulton points out. The chute would merely fall out of the compartment, free of the aircraft.

An additional safety feature is a special heat-treated shear pin in the attaching link on the drag line. Held to extremely close limits of yield and ultimate strength, this pin will fail in shear just below the load which causes structural damage to the aircraft.

200-Knot Maximum

The system is designed for 200 knots maximum speed and successful deployments have been accomplished at low speeds down to 48 knots.

Because the load line of the drag chute passes through or close to the center of gravity of the airplane, no pitch over or pitch up is encountered when the chute is employed, Moulton reports.

In many cases, the pilot elects to use the parachute before touch-down. Usual operation is from approximately one foot above the runway to just after contact. • • •

NEWS BRIEFS

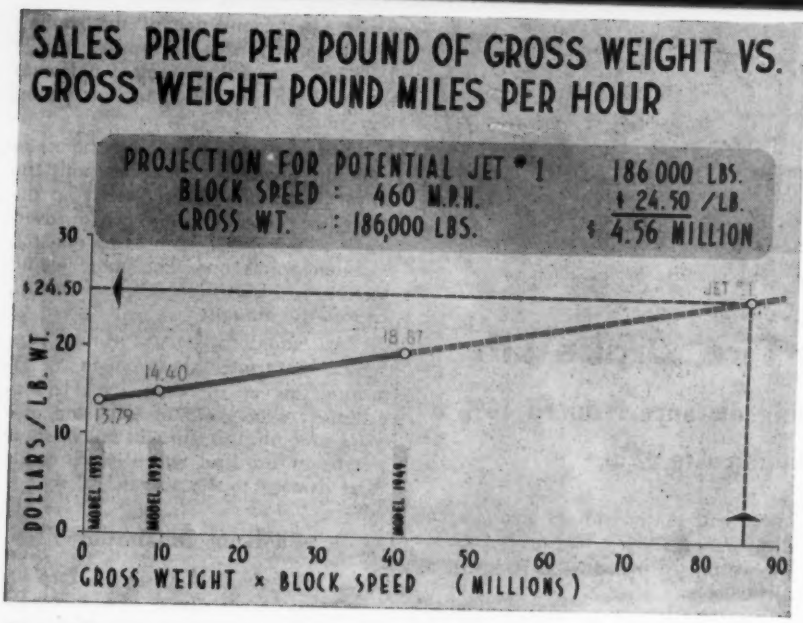
Northwest Airlines has ordered **six Turbo-Compound Super Connies,** for delivery in late 1954 and early 1955, with an option on an additional six. **The Comet III was weighed** in the balance but was found wanting. NWA's plans for replacing its DC-3's are still in the future.

• •

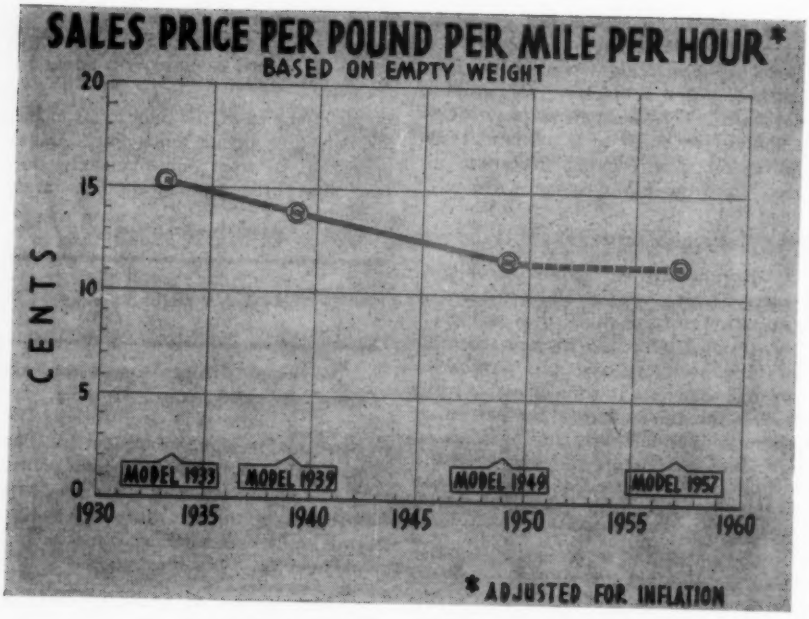
The delivery of **SABENA Belgian Airlines' first Douglas DC-6B** was completed in two stages: from Los Angeles to Gander, from Gander to Brussels. Average speed: 295 mph. Anselme Vernieuwe, vice president of operations for SABENA, did the piloting.

• •

The Air Force has decided not to reactivate the **Galveston Municipal Airport,** according to a letter from Air Force Acting Secretary James H. Douglas to Robert B. Murray, chairman of the Air Coordinating Committee. Local officials had previously protested that air traffic was already seriously congested. • • •



Jet Transports: Unit Prices Up . . .



. . . Price Per Pound-Mile Down

By WILLIAM D. PERREAULT

THE JET TRANSPORT built in the United States to meet current airline thinking on size and performance is going to cost close to five million dollars, without spares, and the operators may as well appreciate this fact and its justification, and proceed to plan accordingly.

This is essentially the message delivered to the aviation industry by Jim W. Barton, chief cost accountant for Boeing Airplane Company, in his paper "Factors Influencing Airplane Costs," presented to the National Aeronautic Meeting of the Society of Automotive Engineers in New York late last month. Barton has been pricing airplanes and parts at Boeing for the past 15 years and was prepared to document his claims.

For almost a year there have been rumblings that the early four-engine jets which will make their apearance in this country between now and 1960 will sell for four to five million dollars, a figure which has crept upward rather rapidly from about three million dollars in estimated costs a few years back.

From the airlines came discontented grumbling indicating that such prices, if true, were wholly unrealistic. The manufacturers, they implied, had lost all interest in doing business in the American way, were unwilling to take a reasonable investment gamble. American Airlines' William Littlewood, in his Wright Brothers Lecture in December, uttered the first public words of reproach regarding jet pricing practices.

Directly and indirectly Barton took up Littlewood's challenge and made clear what the operators will get for their money and what they can do to minimize the cost. His principle recommendation:

Cut Variations

Eliminate all but the most minor variations between airplanes for different customers. This could reduce the total cost of the jet transport by 30% on a 75-plane order.

Barton was speaking from Boeing's experience on the Stratocruiser where, in a 55-plane order, there were three basic cockpit configurations, six different instrument arrangements, five different window configurations, two types of propellers, three galley arrangements, six different berth and seating arrangements, 12 different versions of interior styling, and 20 versions of radio and navigation equipment.

Without ever referring to the fact directly, Barton highlighted the problem which could drive jet transport production from the U. S. to foreign shores in the same manner as U.S. ship building once headed prior to Government-sponsored support for U.S. dockyards—the matter of labor costs in this country and their effect on competition with foreign manufacturers (see chart, p. 23).

Adjusted for U. S. labor and material costs, Barton said, the de Havilland Comet III price of $2,200,000 would become $5,200,000—higher than the highest present U.S. estimate yet for an aircraft essentially smaller. Whereas the quoted Comet prices range from about $28 to $38 per pound of empty weight, adjusted to U.S. labor and materials costs these soar to $66.20 for the Comet I, $68.63 for the Comet II, and $88.67 for the Comet III.

Barton saw no chance for appreciable improvement in these relative prices, although he outlined extensive steps taken by Boeing and all U.S. manufacturers to cut cost substantially. Instead, Barton established the following parameters to prove the justification for the higher prices and the economic wisdom of operating the new plane type:

• **Gross price per plane** increased 3420% between 1933 and 1949, but the price per pound of empty weight was up only 259% during the same period.

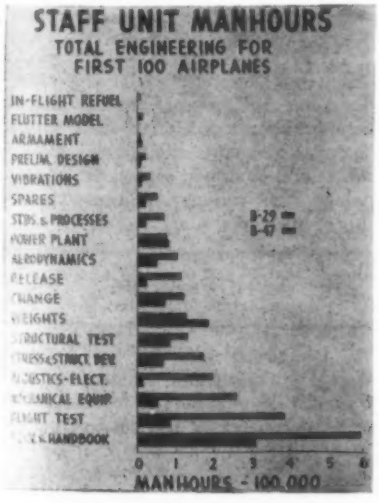
Adjusting the cost per pound of empty weight for inflation, based on Bureau of Labor statistics, and introducing the factor of increased speed of the newer aircraft, Barton established that the price per pound of empty weight per mile had actually moved down about 30% during this period.

• **This improved capability** at lower unit cost was brought about during a period in which fatal accidents per million passenger-miles decreased 93%, passenger fatalities per 100 million passenger-miles flown were reduced 72%, performance factor (percentage of scheduled miles not completed) dropped from 12% to about three per cent.

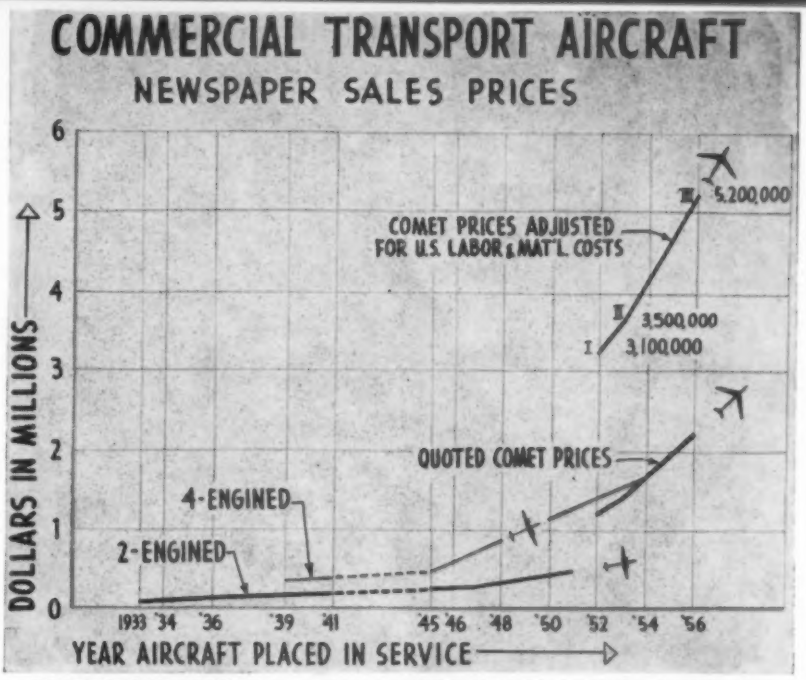
Also it occurred during a period when the cubic feet of cabin volume per passenger, a measure of passenger comfort, increased by 80% and speed and range of the planes increased by leaps and bounds.

These gains are made only by research and development and the inevitable related costs, Barton pointed out. One good yardstick of these improvements is the matter of structural efficiency, as measured by the pounds of gross weight of the aircraft compared with the structural weight.

The plane built in 1933, such as the Boeing 247, carried 2.03 pounds gross weight per pound of structure, the Stratoliner equivalent of 1949 carried 3.90 pounds. A 92% increase in structural efficiency was gained in a period when the cost per pound of weight empty went up 49%.



ENGINES, which brought on the design revolution, contribute little to the increased engineering costs of the modern aircraft, but structural demands and related tests needed for high altitude, high speed flight skyrocket engineering costs.



COMET PRICE would be up to $5,200,000 if built in U. S., Boeing figures show.

The first cost incurred by the manufacturer in modern transports is up noticeably, 151% in the case of the basic engineering of the 1949 transport over the 1933 transport. Basic tooling costs went up 102% during this period.

This emphasizes the penalty experienced by the manufacturer in both metallurgical research and development and in tooling continually to improve the structural efficiency of the plane—to insure that the aircraft will carry a large useful load.

These engineering and tooling costs are non-recurring. The fact that they increased from 10.7% of total costs in 1933 to 14.1% in 1949 represents another serious challenge to the manufacturer. It measures the increased expenditure he must make prior to getting any return from the customer. Thus the 1939 plane would have been engineered and tooled for about $14½ million, while the 1949 model would have cost $29¼ million to this stage of development.

To illustrate the cost elements of the large piston-engine plane of a few years back as compared with a modern jet aircraft, Barton noted major differences in the Boeing B-29 and B-47. The B-29 had nine electronic systems and the B-47 has 14 (up 55%); the B-29 had 150 tubes, the B-47, 650 (up 333%); the electronic equipment weight of the B-29 was 530 pounds, that of the B-47 is 2,500 pounds (up 371%).

No small factor in increasing costs is the matter of ordinary manufacturing demands. The assembly jig for the upper wing panel of the B-377 cost $27,500, while that of a modern jet will run $220,000. Many factors contribute to this. The Stratocruiser uses flat skin .060″ thick; the jet uses machine-tapered sections up to .400″ thick and in such large sections that hoists are required to handle them.

Stringers of the Stratocruiser wing panel are of constant thickness at .125″ while those of the jet are machine tapered, up to .500″ thick. Rivets in the early transport were 5/16″, rivet hole tolerance was .014″, and only limited inspection was required. With the jet, holes are up to ⅜″, many hi-shear rivets and lock bolts are used, rivet hole tolerances are held to .003″, and each hole and countersink is 100% inspected. Drills, drill jigs or cages, and sling requirements are also stiffer.

There is no such thing as a cheap U.S.-built jet transport possible, Barton's paper establishes. Boeing's historical records show that there is a straight-line relationship between the cost of the 1933 model and those of 1939 and 1949 when plotted on a scale of gross weight times block speed (see chart). This shows the 1933 model costing $13.79 per pound of weight, the 1939 model $14.40 per pound, and the 1949 model $18.87 per pound.

Applied to a jet transport of 186,000 pounds gross weight and 460 miles per hour block speed, this relationship would show a cost per pound of $24.50, or $4.56 million for the jet transport.

This may be conservative. • • •

"Red Hot" and Ready

Ready to go! "Fired up" and ready to take off, to be airborne and moving at furious speeds in a matter of seconds.

The components that make up a jet must be right. They must be produced exactly as designed. Turning them out calls for the highest standards of craftsmanship in forming and welding. The aircraft industry demands it!

Years of experience in fabricating stainless steel, aluminum alloys and other allied materials has brought Lavelle widespread recognition as a truly unique and reliable subcontractor.

Lavelle

AIRCRAFT CORPORATION • NEWTOWN, BUCKS COUNTY, PA.

Talbott Assigns Staff Responsibilities

Secretary of the Air Force Harold E. Talbott has assigned responsibilities, subject to his own directions and control, among his assistants as follows:

• **Under Secretary James H. Douglas**—overall direction, guidance and supervision of the affairs of the Air Force and its plans, policies and programs. This responsibility includes supervising and coordinating the activities of all other units of the Office of the Secretary.

• **H. Lee White, Assistant Secretary for Management**—direction, guidance and supervision over all matters in the fields of manpower, military and civilian personnel, Reserve components, training, management improvement program, budgetary and accounting matters, participation in Civil Defense activities, and the loyalty-security program.

• **Roger Lewis, Assistant Secretary for Materiel**—direction, guidance and supervision over all matters in the fields of industrial resources, industrial security and mobilization; procurement planning and programming; procurement, production, storage, maintenance, distribution and disposal of all materiel, supplies and equipment; participation in the Mutual Security Assistance Program; transportation and communications; renegotiation affairs, contract appeals and related activities, and relations with civil aviation.

• **The Special Assistant for Installations** (yet to be named)—direction, guidance and supervision over all matters regarding installations planning and programming, acquisition and disposal of real estate, assistance in international negotiations on bases and facilities, construction of bases and facilities, and family housing.

• **Trevor Gardner, the Special Assistant for Research and Development**—direction, guidance and supervision over basic and applied research, development, determination of qualitative requirements and continual integration of technology with military requirements and procurement planning.

NEWS BRIEFS

Douglas Aircraft sold $231.6 million worth of airplanes in the quarter ended February 28, as compared with its record of $81.3 million for the same period last year.

• •

Piper Aircraft Corp. has dubbed its **twin light transport "The Apache"** and has announced that the prototype has completed 300 flight hours. Component production is under way for the first run of 10 Apaches, with the next production run set for 100 planes.

SAE Members Swap Production Know-How

Process research, long neglected, needs industry and government attention, Hurley tells forum.

PRODUCTION know-how, resulting from either process research or trial and error, has always been the key to large-scale aircraft output. The military has always devoted the bulk of its research and development funds to just that—design research and development — and the production short cuts have not been analyzed and used to the greatest possible extent.

Hurley

In an attempt at remedying this shortcoming, the Society of Automotive Engineers' National Aeronautic Meeting in New York scheduled, under the sponsorship of Curtiss-Wright Corp. president and chairman Roy T. Hurley, an Aeronautic Production Forum. Designed to help break aircraft bottlenecks by bringing together men with common production problems, the Forum was given over to 10 day-long panels in which representatives from major aircraft companies went over their dilemmas and reported on their attempts to solve them.

Hurley pointed out just before the 10 panels got under way that it was through discussions such as these and through greater emphasis on the comparatively few process research projects which the military has undertaken that America's aircraft industry could do an even better production job than it is doing. Hurley should know: the machinability report which C-W turned out for the Air Force in 1949-1950 has attained a circulation of nearly 20,000 copies, and it is estimated that the machinability program has yielded benefits of $1.5 million, roughly 10 times the cost of the report itself.

The panel discussions at the SAE forum brought the following problems to light:

• **Inspection and Quality Control** (Panel chairman: E. S. Marks, Pratt & Whitney)—While there is no standardization as to whether quality of the product is basically the responsibility of a man's production or quality control departments, most of the plane companies represented agreed that the production group must assume the credit or blame for the high or low quality of the finished product.

• **Large Forgings and Castings** (Panel chairman: G. W. Motherwell, Wyman-Gordon Co.)—The USAF's heavy press program involving production of large aircraft forgings and extrusions should get into production later this year and all through 1954. Most of the aircraft companies which have had experience with forgings are enthusiastic, but those which have not remain skeptical of their advantages. Few orders for forged parts from the 17 new presses are on the books as yet, but that is expected to be taken care of when the presses are installed. Main field for castings seems to be in the engine rather than the airframe, although tolerances remain the major problem here. There seems to be a big field for B-grade castings in short-life equipment, such as expendable guided missiles.

• **Precision Forming and Joining** (Panel chairman: Michael Watter, The Budd Co.)—Sheet metal fabrication now involves engine producers as well as airframe companies, and both types of companies have to find new ways of handling heat-resistant alloys. High resistance to corrosion and high temperatures means the use of high-temperature brazing, while copper brazing seems satisfactory for low strength and temperatures.

• **Experimental Manufacturing** (Panel chairman: Allan Chilton, Wright Aeronautical)—It was generally agreed that makers of experimental parts should be given a good idea of ultimate production requirements to help their thinking. Prime contractors as a rule give little financial and technical assistance to experimental subcontractors.

• **Production Procurement** (Panel chairman: J. Ralph Walker, Fairchild Engine Division)—New methods are constantly being developed to turn up satisfactory subcontractors. After such subcontractors are discovered, it is the responsibility of the military and the prime contractor to educate them to the exact requirements.

• **Machining** (Panel chairman: K. W. Stalker, General Electric's Aircraft Gas Turbine Division)—Machining of the newest aircraft materials is not as much of a problem as had been expected. The high-temperature alloys and stainless steel are being handled with little difficulty. Among the newest machine tools for aircraft output are a milling machine with a feed of 375″ a minute and a cutting speed of 10,000 feet a minute, and a broaching machine with a cutting speed of 120 feet per minute.

• **Machine Tools and Tooling** (Panel chairman: I. J. Keough, Republic Aviation)—Machines with heavier cuts and higher speeds are still needed in aircraft production. Those firms which have purchased foreign tools during the current buildup have found that generally speaking these machines are built on a lighter scale than similar machines in the U.S. and have insufficient horsepower. The aircraft industry spokesmen feel they are not being considered in tool development, but the tool builders claim aircraft firms expect too much of them. Use of optical tooling is not very prevalent on U.S. machines as yet, but satisfactory optical instruments for use with U.S. machine tools are on the way.

• **Titanium** (Panel chairman: W. L. Finlay, Rem-Cru Titanium, Inc.)—Most of the 2,000 tons of this new metal to be produced this year will go into aircraft, and output is slated to rise to 5,000 tons in 1954 and 12,000 in 1955. Results in using the metal for aircraft construction seem to justify the fantastic expenditures. Greatest use of titanium is expected to be in aircraft engines, since elimination of one pound of weight in the engine is equivalent to saving eight pounds in the airframe.

• **Jet Engine Buckets and Blades** (Panel chairman: W. M. Williams, Thompson Products, Inc.)—No two companies use exactly the same techniques in making compressor buckets and turbine blades. Every firm seems to prefer producing them in accordance with its own past experience, e.g., forging, casting, rolling, stamping, etc. One experience encountered by all firms in this field is that as the engine's power is increased, higher alloy materials are required, each such alloy being harder to fabricate than the last.

• **Manufacturing Management** (Panel chairman: H. Ford Dickie, G-E's Aeronautics and Ordnance Manufacturing)—Few firms in the industry have taken advantage of formal college courses in business management, maintaining that the men cannot be spared. The rebuttal was that it is possible to send only one man and tell him to set up a training program on his return. Universal question seems to be whether the college-trained technical man is equal to or inferior to the man who came up through the shop, and how you can justify higher salaries for the college man. • • •

Three Yardsticks for Growth

	Personnel Jan. 1			Floor Space (sq. ft.) Jan. 1			Sales Previous 12 Mos. (dollars) Jan. 1		
	1947	1950	1953	1947	1950	1953	1947	1950	1953
American Helicopter Co.	NA	NA	NA	2,000	10,000	100,000	..	..	..
Bell Aircraft Corp.	NA	NA	2,750	NA	NA	554,000	NA	NA	*30,000,000
Doman Helicopters, Inc.	4	15	105	1,000	3,500	31,000	30,000	270,000	600,000
Gyrodyne Co. of America ...	5	25	100	500	5,000	30,000	..	..	250,000
Hiller Helicopters	..	145	650	..	60,000	130,000	..	500,000	12,000,000
Kaman Aircraft Corp.	18	25	990	25,000	25,000	135,000	..	50,000	7,277,322
Piasecki Helicopter Corp. ...	450	749	4,886	60,000	135,000	613,000	1,148,689	5,022,411	64,450,014
Prewitt Aircraft Co.	5	11	151	..	3,500	53,500	1,250	110,226	1,315,766
Sikorsky Aircraft Div.	836	1,200	4,300	234,500	325,300	611,000	[1]	[1]	[1]

* *Estimated*

[1] *United Aircraft Corp., of which Sikorsky is a division, does not break down sales by divisions.*

'53 Biggest Year Yet for Helicopters

Backlog reaches new high; rotor developments, new designs bring more companies into industry.

By James J. Haggerty

ROTARY WING aircraft have actually been flying, with varying degrees of success, almost as long as fixed wing planes, but 1939 is generally recognized as the start of America's helicopter industry.

It was in that year that Igor Sikorsky, who had designed a helicopter as early as 1909 but had spent three decades working on fixed-wing types, returned to the rotary wing field and flew the VS-300, the first successful direct-lift machine built in the U. S.

Only 14 years have passed since the first flight of the VS-300, but in that time the growth of the helicopter industry has been little short of phenomenal. World War II provided some momentum—a few Sikorsky R-4's saw service (though not combat service) in the China-Burma-India theater. It was the Korean war, however, which provided the real impetus and brought about a helicopter production rate which some of the visionaries of the industry would not have predicted five years ago.

Last year, the 13th year of the helicopter era, was the big year for the rotary wing industry, with estimated sales of more than $150,000,000 (exact figures are not available, since Sikorsky Aircraft Division of United Aircraft Corp., one of the largest producers, is not permitted to break its sales figures out of the UAC total because of company policy). Piasecki Helicopter Corp., which was not even in existence when Sikorsky flew the VS-300, topped the field in sales, with more than $64,000,000 worth of tandem-rotor military helicopters.

This year promises to be an even bigger year. The industry has a known backlog of close to $400,000,000, plus whatever Sikorsky has on the books. In addition, the current military budgets envision procurement of another $400,000,000 worth.

Basic helicopter operation is inherently full of vibration and noise. This has led to a number of new rotor system developments, each designed to improve the vibration and noise effect and to improve the load distribution problem or limited center of gravity travel available in loading helicopters. As a result of the new rotor developments, a number of new companies have joined the helicopter industry.

New Companies

Typical is Doman Helicopters, Inc. The Doman rotor head differs basically from those on other helicopters in its method of mounting to the fuselage. Unlike others, the revolving Doman rotor hub is free to tilt in all directions from a non-rotating universal support. Thus, when the plane of the rotor is inclined to produce horizontal flight thrust, the engine drives the rotor smoothly through a constant-velocity universal joint.

There are neither flapping hinges nor lag hinges revolving with the rotor. Rotor blades are mounted on flexible steel supporting bars to permit them to follow a path which deviates from a true plane.

Kaman Aircraft Corp. another comparative newcomer to the field, favors the intermeshing rotor system, which permits elimination of the anti-torque tail rotor and the pilot control coordination required to operate it. It also provides a fully symmetrical system.

Kaman, in its HTK helicopter, also uses a different power transmission system, in which the engine is mounted in its normal horizontal position. Thus, the engine requires no modification, it is fully accessible for maintenance and fully separated from the rotor system, making it possible to remove and install the power plant without disturbing the rotor transmission, rotor controls, etc.

Another Kaman innovation is the servo-flap on the rotor blades for stability. The plane itself is easy to fly because the intermasher is a balanced system torque-wise. Any change in power to the main rotor (thus a change in torque) on a single rotor plane requires tail rotor correction. In the intermasher, any change in power has no effect; the rotors turning in opposite directions are always in torque balance.

Piasecki Corp. has specialized in the tandem rotor configuration, for greater center of gravity travel due to the two-point "suspension." This configuration can employ either a single engine driving both rotors by a connecting shaft, or two engines, either one of which would be capable of driving both rotors in an emergency.

American Helicopter Co. and Hiller Helicopters are proponents of the

BELL Helicopters turn years into days—

days into hours in British Columbia

When engineers started to plan for the half-billion dollar smelter project of the Aluminum Company of Canada, Ltd., in the wild Kitimat-Kemano district of the Canadian Rockies, their experience told them it would take years to complete.

That was before they called in the helicopters. On the first surveying job with this versatile aircraft,

they wound up five years ahead of schedule in 20 flight hours.

When it came time to plot the tunnel borings for the huge underground powerplant at Kemano, best guess was it would take two years with a 20-man team. That was the old way. *Two men and one helicopter did it in three months.*

Five Bell helicopters are speeding the work of the Morrison-Knudsen Construction Co. by hauling men and materials to tiny landing platforms at construction camps scattered up to 8,000 feet, saving valuable time as well as money.

Despite the cold, snow and fog of British Columbia winters, these helicopters have stayed on the job, proving their worth in the construction business, just as they have in every other role from crop dusting to evacuating wounded in Korea.

BELL Aircraft CORPORATION

BUFFALO 5, NEW YORK FORT WORTH, TEXAS

Actively engaged in the research and development and production of Helicopters, Guided Missiles, Specialized Research Aircraft, Rocket Motors and Electronics Equipment.

Thumbnails

AMERICAN HELICOPTER CO.

American Helicopter Co. was founded as a California corporation by Corwin D. Denney in July, 1947, for the purpose of developing pulse-jet powered rotary wing aircraft. In January, 1949, the company flew the first such helicopter, the XA-5 "Top Sergeant." In February, 1951, American helicopter's second pulse-jet, the XA-6 "Buck Private," took to the air.

In June of the same year, as the result of a design competition, American Helicopter was awarded a military contract to design and build the XH-26 "Jet Jeep," the first flight of which was made in June, 1952, just one year from the date the contract was let. Additional models of the XH-26 were ordered for evaluation purposes.

BELL AIRCRAFT CORP.

Bell Aircraft Corp. was founded in 1935, when Consolidated Aircraft Corp. moved from Buffalo, N. Y., to San Diego, Calif. Lawrence D. Bell, who had been Consolidated's vice president and general manager, decided to remain in Buffalo and organize his own company.

Initial work was concentrated in two military fighters, the Airacuda and the Airacobra, and during the war years, Bell also produced 663 Boeing B-29's. It was during the war that Bell laid the foundation for its helicopter division by starting a research and development program on the Model 30 helicopter.

Model 30 successfully completed its first flight in July, 1943, and Bell's helicopter work was launched. After additional research, Bell came out with the Model 47, which received the world's first commercial helicopter certificate in March, 1946. Completion of the first production Model 47 was accomplished in December of that year.

Since first commercial deliveries in 1947, steadily increasing demands for the Model 47 required that Bell place more emphasis on helicopter production. Accordingly, in 1951, an autonomous Helicopter Division was created at Fort Worth, Tex. Harvey Gaylord, with the title vice president-helicopters, heads the new division.

DOMAN HELICOPTERS, INC.

Doman was founded in August, 1945, by Glidden S. Doman, who had been chief stress engineer for Sikorsky. Doman founded his company to investigate the possibilities of a hingeless rotor system and first tested the system in May, 1947, with a plane called the LZ-1, which was actually an Air Force-loaned Sikorsky R-6 airframe with the Doman rotor system. The first Doman-built helicopter, the LZ-4, flew in the fall of the same year.

Development work led to the current model, the YH-31, now in production for the Army. The first production model YH-31 made its first flight late in April.

"power at the rotor tips" school, American using the pulse-jet and Hiller the ramjet. Simplicity is the keynote of this type of rotor. American's XH-26, for instance, is powered by two pulse-jets, one located at each tip of the single rotor blade. Each engine has only one moving part which when worn can be replaced in a matter of minutes at low cost. For fuel it can burn gasoline, kerosene, or oil.

Pulse-jets can be started in any kind of weather and require no warm-up for operation.

In addition to its ram-jet design, which is basically similar to American's pulse-jet system, Hiller has another rotor system, used on its Model 306, called the "Rotormatic Control." It consists of a normal, single-bladed rotor, plus a small servo rotor connected through a universally mounted transfer bearing and simple linkage with the pilot's controls.

The servo rotor produces the effect of cyclic pitch changes in the rotor. This system provides an exceptional degree of stability.

Coaxial System

Gyrodyne Co. of America prefers the coaxial rotor system, with one blade mounted atop the other, operating off a single pylon and rotating in opposite directions. This provides a substantial center of gravity travel, inherent stability, and elimination of servo tabs, gyroscopic bars, offset hinges, drag hinges or articulating hinges, simplifying production and maintenance problems.

It also requires the minimum amount of shafting of any transmission-driven helicopter and concentrates all transmission gear and shafting in a small area near the top of the fuselage.

Newest-comer to the field is the Jacobs Aircraft Engine Co., which features a unique high-speed design. It utilizes a conventional three-bladed main rotor system plus an antitorque tail rotor, but in addition it has a small, three-bladed pusher propeller mounted in the tail.

The prop has an adjustable pitch angle so that the pilot can use zero angle of attack for vertical ascent. Jacobs claims a speed potential of 185-190 miles per hour with this design.

These are some of the new rotor systems which have cropped up to challenge the supremacy of old-timers Bell and Sikorsky in the helicopter field. There will undoudtedly be others coming along as research in the rotary wing field picks up due to military demand.

Meanwhile, there are a number of new developments coming along. Sikorsky is working on a large transport helicopter (reportedly about 30 passen-

Thumbnails

GYRODYNE CO. OF AMERICA

Gyrodyne was formed in 1946 by Peter J. Papadakos, an engineer who had worked for Curtiss-Wright, Bell, and Grumman, to exploit the possibilities of the coaxial rotor system and the four-bladed rotor.

The company acquired the assets of the defunct Helicopters, Inc., including drawings, data, patents and inventory, which consisted of two partially completed and one almost complete experimental helicopters. In December, 1949, the company flew the nation's first convertiplane, the "Helidyne." Current activities are centered around flight test work on the Model 2C coaxial helicopter, which recently completed a Navy evaluation.

HILLER HELICOPTERS

Stanley Hiller, Jr., now president of Hiller Helicopters, founded the company in December, 1942, when he started work on his first helicopter, the XH-44 in a Berkeley, Calif., garage. The plane, a co-axial type, was completed in 1943 and flown the following year.

Development work on this type of helicopter was continued during World War II, when Hiller became associated with Henry J. Kaiser, as the Hillercopter Division of Kaiser Cargo Co. During this period, Hiller built the X-2-235 co-axial helicopter under Navy contract. At the end of the war, the Kaiser affiliation was terminated.

In 1945, the company moved to Palo Alto, Calif., and continued development work which led to CAA certification of the Hiller 360, a single-rotor helicopter utilizing a new control system called the "Rotor-Matic Control." Hiller had wide commercial sales during 1949 and 1950, and converted to military production with planes like the Army H-23 and the Navy HTE with the outbreak of the Korean war. The company now has more than 400 subcontractors and vendors throughout the U. S.

KAMAN AIRCRAFT CORP.

Charles H. Kaman started Kaman Aircraft Corp. in December, 1945. His original "plant" consisted of the cellar and garage of his home in West Hartford, Conn. In November, 1946, the company moved to Bradley Field, Windsor Locks, Conn., and continued development of the experimental K-125, which flew in January of the following year.

The K-125 was followed in the development pattern by the K-190, certificated in April, 1949, and the K-225, certificated in September of the same year. Current production model is the three-place Navy HTK-1, which has been flying since 1951.

The company which started in a cellar and a garage less than eight years ago had a sales volume of over $7,000,000 last year and has a backlog of more than $28,000,000.

Thumbnails

PIASECKI HELICOPTER CORP.

Piasecki Helicopter Corp. was originated in August, 1940, by a group of young engineers (one of whom was Frank Piasecki, now chairman of the board) who met for discussions and experiments in rotary-wing design. The company was incorporated in 1943 as the P-V Engineering Forum. In 1946, it was refinanced, expanded, and given its current name.

Starting with five engineers in a small Philadelphia store, the company now employs over 4,000 in four plants, with a total of more than 613,000 square feet of floor space. The company has since completed contracts with the Navy Bureau of Aeronautics for three experimental tandem-transport helicopter types, 20 production HRP-1's and five HRP-2's.

In addition, three experimental XHJP-1 fleet helicopters were built. The XHJP-1 contract led to a production order for more than 200 HUP fleet helicopters, now in regular Navy service.

In January, 1950, PHC won an Air Force competition for a tandem transport helicopter which could also be used for rescue, assault, cargo, and troop transport. This resulted in a production contract for H-21 helicopters. Piasecki is now one of the largest helicopter manufacturers in the world.

PREWITT AIRCRAFT CO.

In May, 1946, Richard H. Prewitt, engineer and designer in the autogiro-helicopter field, established Prewitt Aircraft Co. in the garage of his home at Wallingford, Pa., for the purpose of developing and producing the "ideal" metal rotor blade.

In 1947, Prewitt won a design competition among blade designers for further cooperative development of his blade design. The blade passed "whirl" tests in 1949, the same year that Prewitt acquired a 3,500 square foot facility at Clifton Heights, Pa. In March, 1951, Prewitt delivered a set of blades to Piasecki Helicopter Corp. for flight testing on an XHJP-1 helicopter, and the same year entered into a contract with Piasecki for 150 blades for the Navy HUP-2 helicopter.

The company's facilities were expanded by the lease of 15,000 square feet of floor space in Clifton Heights. Prewitt is now in production on its bonded steel blade and anticipates additional orders. Floor space has now grown to 50,000 square feet.

SIKORSKY AIRCRAFT DIVISION

Sikorsky's history probably dates to 1923, when Igor Sikorsky founded Sikorsky Aero Engineering, but its helicopter history dates to 1939, when the VS-300, generally accepted as America's first successful helicopter, completed its first flight. (The company at that time was Vought-Sikorsky.)

In 1943 the company was made a division of United Aircraft Corp.

Development work on the VS-300 led to the wartime R-4, later the R-5 (now H-5), and eventually to the 10-place S-55, now in wide service with both military and commercial operators.

gers) which may find a wide future market in the commercial field—the XHR2S-1 (also S-56) being built for the Marine Corps. Sikorsky also has a new small Navy anti-submarine design, the XHSS-1 (or S-58).

Bell has a larger anti-sub plane, the XHSL-1, which may also have commercial transport possibilities.

In the very large class, Hughes Aircraft Co. is working on a super-size development of its jet-powered XH-17. The new plane, which will be even larger than the giant XH-17, is designated XH-28. Piasecki is readying its 40-passenger XH-16 for flight late this year and is also developing a turbo-rotor version of the same plane, which presumably will be able to handle an even greater load.

New Ram-jet

Hiller has just come out with a new version of its ram-jet powered Hornet, a two-place Army vehicle designated YH-32. Cessna Aircraft Co., which took over the former Seibel Helicopter Co. is developing a new prototype but is not yet discussing the design.

Sikorsky, McDonnell, Bell, and Gyrodyne are all working on convertiplane designs, and at least one actual prototype will make its appearance shortly.

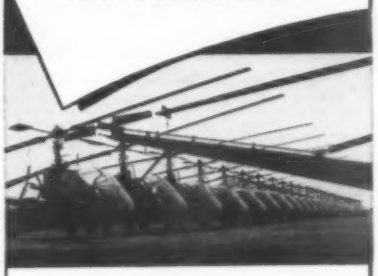
The outlook for the future of the helicopter industry could not be better. There is no indication that the military demand will fall off for some time to come, as new tactical uses for the helicopter are being discovered every month. If anything, the military should present an even greater market in the next two years.

At the same time, commercial operators are planning to start passenger service in the near future. This should build up a new market over a period of years to take up the slack if the military requirements should fall off.

• • •

Air mail stamp commemorating the 50th year of powered flight has been issued by the Post Office Department and will be placed on sale May 29 in Dayton, O., home of the Wright Brothers.

PRODUCING
for today...
BUILDING
for tomorrow



This headline tells the story! Hiller Helicopters is presently giving its full energies to Armed Forces production . . . to keep our Military Services properly equipped.

However, we are also building and working toward a better tomorrow. Our engineers are already at work on plans for new Rotary Wing advances which will set the pace for tomorrow's commercial helicopter development.

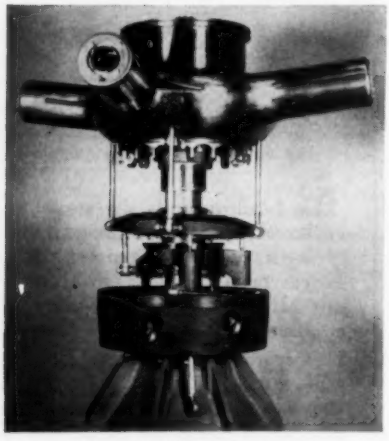
Look to Hiller—one of the oldest, and best known names in Rotary Wing production — to continue a position of leadership in the helicopter field!

HILLER
HELICOPTERS
1350 WILLOW ROAD • PALO ALTO, CALIF.

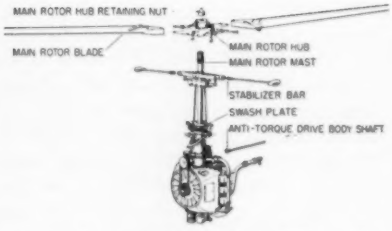
1. The simplified Seibel (now Cessna).

2. Gyrodyne's coaxial.

3. The McDonnell twin-rotor.



4. Doman's hingeless system with gimbal-mounted hub.



5. Single-rotor Bell with stabilizer bar.

6. Kaman's intermesher with servo flaps.

Rotors—
the vital difference

7. Hiller's stable "Rotormatic."

8. The French Aeriel III (with tip-mounted Turbomeca Artoustes).

9. American Helicopter's pulse-jet.

10. The three-bladed Jacobs, which also employs a pusher prop.

11. McCulloch's tandem.

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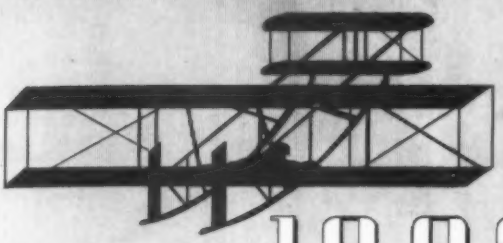
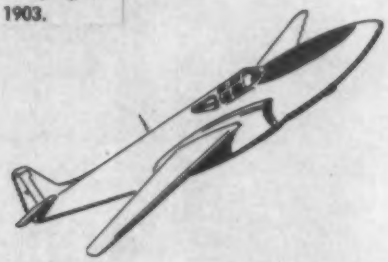
American Helicopter Specifications

Manufacturer	Model	Gross Weight	Empty Weight	Passenger Capacity	Range (Miles)	Speed (mph)	Engines	Horsepower	Vertical Rate of Climb (fpm)	Best Rate of Climb (fpm)	Rotor Diameter	Length	Height	Rotor Arrangement	Remarks
American Helicopter	X4-26	900	300	1	1½ hrs.	80	2AJ-7.5" AHC Pulsejets	Restricted	Restricted	Restricted	Restricted	Restricted	Restricted	Single	
Bell	47D-1	2350	1400	3	196	98 max. 78 cruise	1 Franklin	200	440	970	35' 1½"	41' 4¾"	9' 4-5/16"	Single	
Bell	47TL-5	2350	1400	3	196	98 max. 78 cruise	1 Franklin	200	440	970	35' 1½"	41' 4¾"	9' 4-5/16"	Single	2 litter patients, 3 in cabin
Bell	H-13E	2350	1400	3	196	98 max. 78 cruise	1 Franklin	200	440	970	35' 1½"	41' 4¾"	9' 4-5/16"	Single	2 litter patients, 3 in cabin
Bell	XH-15	2700	2000	3	360	100+	1 Continental	245	450	850	37' 4"	44' 9"	8' 10"	Single	
Bell	YH-12	6400	4200	8-10	590	120 max. 90 cruise	1 P&W R-1340	600	600	1,300	47' 6"	58' 9 13/32"	11' 3-9/16"	Single	
Bell	X4SL-1	Restricted	Restricted	Restricted	Restricted	Restricted	1 P&W R-2800	Restricted	Restricted	Restricted	Restricted	Restricted	Restricted	Tandem	
Doman ...	YH-31	4419	2860	2 litters	220	96 knots	1 Lycoming SO-580-D	400	....	1,300	48'	38'	5' 11"	Single	
Doman ...	L2-5	4419	2860	10	240	104	1 Lycoming SO-580-D	400	....	1,300	48'	38'	5' 11"	Single	
Gyrodyne ..	2C	5400	3800	5	250	87 knots max. 74 " cruise	1 P&W 985	450	625	1,030	48'	18'	14' 2"	Twin Coaxial	
Hiller	H-23B HTE-2, 12B	2500	1737	3	140	84	1 Franklin	200	....	770	35'	27' 8"	9' 10"	Single	12B empty wt = 1656# HTE-2 = 1754#
Jacobs	104	3627	2096	5	427	185	1 Jacobs R755-E	350	....	1,600	36'	23' 4"	12' 10"	Single	Convertiplane
Kaman	K-125 Exp.	Varied	Varied	1	150	70	1 Lycoming 4 cyl.	125	Varied	Varied	Varied	Varied	Varied	Intermesh	
Kaman	K-190	2500	1780	2	200	75	1 Lycoming 6 cyl.	190	130	650	40"	23'	11' 6"	Intermesh	
Kaman	K-225	2600	1810	2	200	75	1 Lycoming 6 cyl.	225	300	900	40"	23'	11' 6"	Intermesh	
Kaman	HTK-1	Restricted	Restricted	2	Restricted	Restricted	1 Lycoming 6 cyl.	240	Restricted	Restricted	41'	20' 6½"	12' 5"	Intermesh	
Kaman	HO K-1	Restricted	Restricted	3	Restricted	Restricted	1 Continental 9 cyl.	500	Restricted	Restricted	Restricted	Restricted	Restricted	Intermesh	
McCulloch	MC-4C	2300	1600	1	200	105	1 Aircooled 6 cyl.	200	....	1000	23'	32' 5"	9' 3"	Tandem	2 litter patients
McDonnell	XH-20	780	280	2	....	50	2 Ramjet	....	....	....	18'	12' 6"	7'	Single	Experimental ramjet
McDonnell	XHJD-2	....	....	2-10	....	100+	2 P&W R-985	900	....	....	46'	32' 2"		Partial intermesh	1 experimental
Piasecki ..	HRP-2	7129	5205	10	300+	105	1 P&W R-1340	600	380+	950+	41'	54'	15' 10"	Tandem	
Piasecki ..	HUP-2	5750	4100	6	400	109	1 Continental R-975	560	650	1000	35'	32'	13' 2"	Tandem	
Piasecki ..	H-25	5750	3690	6	400	109	1 Continental R-975	560	650	1000	35'	32'	13' 2"	Tandem	
Piasecki ..	H-21	13,300	8906	22	355	130	1 Wright R-1820	1425	600	1600	35'	52' 6"	16'	Tandem	
Piasecki ..	H-16	....	....	44	....	....	2 P&W R-2180	1650	....	....	44'	113'	31' 1"	Tandem	
Sikorsky ..	S-51, H-5 HO3S	5500	3805	2	260	103	1 P&W R-985	450	200	1000	49'	57' 8"	12' 11"	Single	Out of production
Sikorsky ..	S-52-2, YH-18 HO5S-1	2700	1825	3-4	306	111	1 Franklin 6V6-25-B16F	245	....	1050	33'		8' 8"	Single	No longer in production in U. S.
Sikorsky ..	S-55, H-19A HRS, HO4S	6835	4785	10-12	410	105	1 P&W R-1340	600	300	1130	53'	42' 2"	13' 4"	Single	Also by Westland in Britain and SNCASE in France



The Wright Brothers' first success with the "flying machine" was in 1903.

1903



1944

The first American jet propelled ship was produced by Bell Aircraft Company in 1944.

Doman and its suppliers pay tribute, on the 50th anniversary of flight, to great Americans of transportation. They salute Henry Ford, a genius of the automotive world whose "flivver" first appeared in 1896; Orville and Wilbur Wright, who flew their original "box kite" in 1903; Bell Aircraft Company for its initial flight of jet powered aircraft in 1944, and Dr. Igor Sikorsky, who flew his pioneer helicopter in 1939.

1896

Henry Ford's first production automobile appeared in 1896.

1953

As its contribution in this endless parade of transportation down through the years, Doman presents its 1953 model helicopter. Its twin-engine ship has the world's only four-bladed, hingeless single rotor. The Doman "Twin" is more powerful, carries greater payload per mile and is swifter than its sister ship—the LZ-5. Its ceiling and range are greater. Passenger and freight loading are easier and quicker through seven-foot folding doors. With improved performance, the Doman Twin combines reliability with twin gas turbine economy, for reduced maintenance and operational costs are Doman watch words. Soon, Doman helicopters will be produced in quantity to fly still bigger payloads further in greater safety.

- The Cleveland Pneumatic Tool Co., Cleveland, Ohio
- The Goodyear Tire & Rubber Co., Inc., New York, N. Y.
- Kollsman Instrument Corp., New York, N. Y.
- Lycoming-Spencer, Williamsport, Pa.
- Twin Disc Clutch Co., Racine, Wisc.

DOMAN

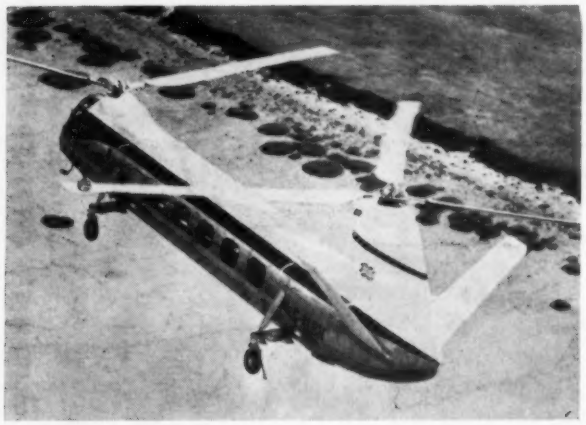
HELICOPTERS INC.

DANBURY, CONNECTICUT

Bell Aircraft's XHSL-1 anti-submarine helicopter, the company's first departure from a single-rotor design, was the winner of a Navy competition in June, 1950, and made its first flight early in March. The craft is powered by a Pratt & Whitney R-2800 engine. Civil version will carry 16.

↑ **H-21** built by Piasecki Helicopter is a more powerful and modified version of the Navy HRP-2 in production for the Army and Air Force.

Doman YH-31 is built to carry two litter patients and an attendant or 10 passengers, with a maximum speed of 104 mph. Production model flew late in April. ↓

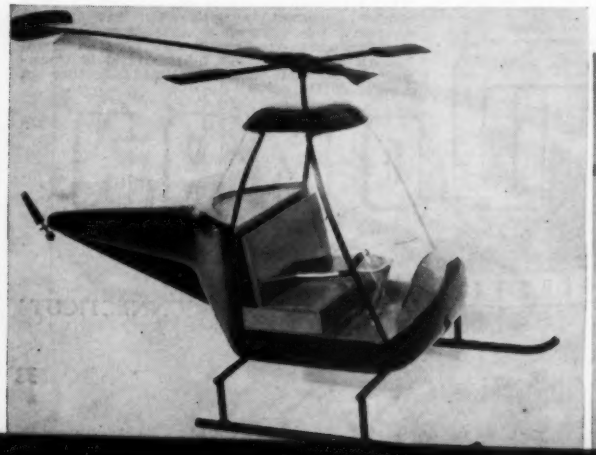


↑ **Britain's Bristol 173 "Flying Bus"** carries 15 passengers at a maximum speed of 142 mph. Grossing 10,600 pounds and powered by two Alvis Leonides it is the largest British helicopter flying. Prototype flew in January, 1952.

Hiller's YH-32, a military development of the HJ-1 Hornet, carries one passenger in addition to the pilot, grosses 1,200 pounds, and can hit a top speed of 76 mph. Power is supplied by two ramjet engines at the tips of the rotor blade. ↓

↑ **Sikorsky S-55,** known as the H-19 by Army and the USAF, HO4S by the Navy, and HRS by the Marine Corps, will carry 10-12 passengers, and has a maximum speed of 105 mph.

Kaman HTK-1, derived from the K-225 commercial utility model, carries two passengers. Tests are also being conducted on a K-225 powered by a Boeing YT-50 gas-turbine engine. ↓



French contender is the Hurel-Dubois HD-32, if financial difficulties can be overcome to finally allow production. The transport carries 40 passengers and has a gross weight of 37,400 lbs. Powered by two Pratt & Whitney R-1830 Twin Washp engines, the plane is said to cruise at 167.6 mph.

DC-3 Replacement— 'Copter or Fixed Wing?

"If we are going to replace DC-3's . . . the replacement may well be the helicopter."—Peter Masefield, BEA

Scottish Aviation Twin Pioneer, now in prototype, is an outgrowth of the single-engine Pioneer Mk. 11, and is equipped with two Alvis Leonides engines. It will accommodate from 14 to 16 passengers and will have a maximum speed of 185 mph, with maximum weight at 12,500 lbs. Estimated cost is $84,000.

The future of Canadair CL-21 is still being decided. Officials are conducting market surveys to decide on the feasibility of going into the prototype stage. Design is for high-wing, pressurized, twin-engine transport with a 32-passenger capacity. Engines will be Wright Cyclone 9HE of 1,525 hp to produce cruise speed of 254 mph.

de Havilland Heron, mentioned as a replacement for the DC-3, seats 14 to 17 passengers. Gross weight is 12,500 lbs. With cruise speed of 160 mph through the power of four 256-hp D. H. Gipsy Queen engines. The prototype of the Heron 2 has been scheduled to undergo flight tests in the near future.

Fokker F-27 prototype is scheduled to fly in 1954, and, if interest warrants, deliveries can begin in 1956. Scheduled to sell at $325,000, the Dutch transport will have two prototypes. The first to be a turboprop version powerd by Rolls-Royce Dart engines and the second to have Wright Cyclone piston engines.

Spanish aircraft is flight testing the prototype of the CASA 202 Halcon twin-engine medium transport, design of Construcciones Aeronauticas. The 18-passenger transport has a maximum gross weight of 16,500 lbs. Powered by two Spanish 750-hp Elizalde B.1A engines, the plane cruises at 185 mph.

PRESENT AT SAN JUAN helicopter meeting were such industry figures as (left to right) Jack Dyment, TCA (chairman of helicopter symposium); S. Krzyczkowski, IATA; J. Kelly-Rogers, Aer Lingus (chairman of technical conference); Dr. Edward Warner, ICAO; Igor Sikorsky, United Aircraft Corp.; Carl Agar, Okanagan Helicopters; Fred Glass, Port of New York Authority; C. M. Belinn, Los Angeles Airways. In picture at right, above, are R. L. Cummings, New York Airways; G. B. Clark, Bell Aircraft Corp.; C. M. Belinn, Los Angeles Airways; J. C. Charleson, Canadian Department of Transport; F. Piasecki, Piasecki Helicopter Corp.

IATA Blueprints Transport 'Copters' Future

'No-frill' service planned as manufacturers, airlines agree on important technical and economic questions.

By Anthony Vandyk

SAN JUAN, P. R.—The helicopter is now recognized as an important factor in planning for the future by the airlines of the world as a result of a symposium on rotorcraft held during the Sixth Annual Technical Conference of the International Air Transport Association in San Juan, Puerto Rico, at the end of last month.

Free and frank exchange of information and opinion between manufacturers, operators, regulatory agencies and the military brought about unanimous approval of a series of unofficial resolutions designed to accelerate and facilitate the introduction of transport helicopters on the domestic and international air routes of the world.

It was agreed that in view of the importance of the transport helicopter to the transportation systems of the future, and the mutual dependence of civil and military developments, that the military authorities and appropriate civil regulatory agencies should foster, with the civil operators and the manufacturers, a program of prototype testing of transport helicopters in commercial operating regimes. Objective of this program would be the improvement of helicopter reliability, the development of operating procedures and techniques, and the accumulation of handling experience.

Since commercial transport helicopter operations will need to be carefully adapted to the nature of the cities they serve, the symposium agreed that civic agencies should be encouraged to participate in the prototype testing program, with the object of providing adequate heliports and facilities, and protecting suitable approach paths in built-up areas by keeping to the minimum the number and the height of towers and other aerial obstructions.

Determine Procedures

The symposium agreed that the regulatory agencies should be encouraged to accelerate the determination of the flight safety criteria and optimum approach, landing, and take-off procedures for the all-weather operation of helicopters by flight research.

This resolution was based on the fact that certain of the problems associated with over-city-center operations have a fundamental bearing on the design of future transport helicopters and heliports.

In view of the necessity for operating helicopters under adverse weather conditions near obstacles in order to serve civic centers and otherwise exploit the rotorcraft, the symposium agreed that governmental agencies should be urged to accelerate the development of better weather forecasting, navigational facilities and procedures to meet the problems peculiar to the helicopter, and to institute smoke prevention legislation in built-up areas.

Because of the lack of extensive transport helicopter experience, it was agreed that all regulatory and local governing agencies should be cautioned against restrictive requirements, primarily applicable to fixed-wing aircraft, which might deter the full exploitation of the unique characteristics of this new vehicle.

In order to reduce the cost and increase the availability of transport helicopters both for military and commercial operators, the symposium agreed that government agencies should increase the similarity of design criteria and specifications between civil and military transport helicopters.

These resolutions, although not as yet representing the official voice of IATA, reflect the tremendous interest shown by all the symposium participants, who included such men as Igor Sikorsky, Frank Piasecki and Raoul Hafner on the manufacturers' side, leading executives of all helicopter operators and many of the world's airlines, top government agency representatives, and an ICAO team headed by Dr. Edward Warner, president of the council.

These top-ranking men were able to fill in the answers to a series of carefully prepared questions covering every aspect of helicopter development and operation, thus enabling airlines to learn just what part rotorcraft should play in their planning for the future.

Economics dominates present airline thinking on helicopters, and manufacturers were told in effect: "Build us a vehicle that can make money and we will buy it."

At the moment the manufacturers have nothing to offer for delivery in the next two or three years that will

meet this requirement, but there were several indications that rotorcraft with the present operating economy of the Douglas DC-3 will be available by 1960.

Although there were many suggestions from manufacturers that single-engine helicopters be used initially to gain experience, the airlines asserted that they could profitably use only the sort of equipment which would operate around the clock, in all weather, and with maximum flight safety, a combination of characteristics which they felt was not possible with the single-engine machine.

Speeds Over 130

Operators were generally agreed that initially they would like speeds of not less than 130 mph at 50% piston engine take-off power (or 70% maximum power for turbines), a hovering ceiling of at least 5,000 feet, with a vertical climb rate of 500 to 600 feet per minute.

European operators (BEA and SABENA) wanted a minimum rate of climb of 200 feet per minute with one engine out, whereas U. S. operators asked for hovering ability onto and during the critical part of the ascent, together with a rate of descent which would ensure an undamaged machine.

Throughout the symposium there were certain differences between U. S. and European operators' thinking, due to the fact that in this country the helicopter is used in metropolitan areas, whereas in Europe the airlines are primarily interested in rotorcraft for inter-city operations.

The maximum stage length for which helicopters would prove useful was put at about 250 miles for inter-city and about 75 miles for metropolitan. It was suggested that the helicopter would compete with automobiles over distances less than 30 miles, with railroads on routes of 30 to 175 miles, and with fixed-wing aircraft beyond that.

On inter-city operations a fare slightly above that charged on fixed-wing aircraft services was contemplated. In metropolitan services it was felt that commuter traffic represented the richest potential yet the most difficult field for the helicopter in view of the low rates charged on commuter trains.

In other short-distance travel, such as from suburbs to airports, price competition might not be important, since a passenger might be quite willing to pay five dollars to make a trip in 15 minutes which would otherwise take an hour or two by far cheaper surface transport.

The question of operations to city centers brought up numerous factors, notably, safety and noise. To ensure safe operations over built-up areas, multi-engine helicopters were considered essential. The actual heliports to be used would need to have especially strengthened roofs and precautions against fire hazards

Noise would be a particular problem in round-the-clock operations to and from city centers, but manufacturers are conscious of the need for muffling engines; one possibility is that future helicopters will have more powerful engines, thereby enabling the power penalty of mufflers to be absorbed.

U. S. operators are planning to use heliports on buildings of about 200 square feet, whereas European airlines would prefer a rather larger area, say, 300 square feet. Only minimum space for parking would be required (folding rotors would help to give more space). U. S. operators ask that heliports be able to handle three helicopters at a time.

In order to simplify passenger handling it was hoped to make railroad standards possible for ticketing on domestic operations. Passengers could carry their own baggage but there would be a flight attendant aboard, mainly to take care of the paper work, who would sell tickets. It was agreed that bench type seating for passengers would be adequate, at any rate on metropolitan services.

Cut Out Frills

By agreeing to cut down on frills, the operators did much to bring the operating cost of the helicopter down to a more reasonable level than is possible with present models.

Big items contributing to the present high operating cost of the helicopter are the maintenance and replacement of transmission, rotor heads and rotor blades; the helicopter may wear out several sets of gears and transmissions during its life. Another expensive item is insurance (operators gave the symposium details of the insurance rates which they have to pay) but it was hoped that rates will eventually be lower than those for fixed-wing aircraft, especially when multi-engine types are introduced, because the risks attendent upon take-off and landing are diminished in helicopter operation.

A factor in the reduction of landing and take-off hazards will be the development of electronic approach and navigational aids for helicopters. The ideal approach aid would be one which offered a high degree of reliability, which was self-monitoring, which was easy for the pilot to fly, low in cost, and which required no ground staff to operate it. A distinctive form of visual lighting was also established as a requirement both for identification purposes and to provide the pilot with references for approach and landing.

In an informal review of the highlights of the discussions, J. T. Dyment, TCA's director of engineering, who was chairman of the symposium, said:

"By 1958 or 1960, manufacturers will be able to produce, and airlines will have had sufficient experimental experience to operate 30-passenger helicopters on regular schedules inside metropolitan areas, between cities up to 150 to 200 miles apart, and between islands and country areas in the same general range.

"These helicopters will have at least two engines (piston or turbine) and will be able to cruise at about 150 mph. It is quite possible that they will take off backwards, so that the pilot can keep the heliport in view until he has gained altitude.

Carry Own Baggage

"These helicopter buses will offer the public a new kind of quick, convenient transport, free from traffic jams. It will have no frills. Passengers will carry their own baggage and the interior of the helicopters will give a modern, bus-type standard of comfort.

"On inter-city routes, helicopter bus tickets will probably cost about as much as an airline ticket between the same two points, plus the price of the city-to-airport limousines. In metropolitan service, fares may run in the same range as ground taxicabs."

Dyment said that the discussions had brought out the following requirements:

- **More powerful engines** for helicopters;
- **Better stability** and controllability for slow and hovering flight;
- **New kinds of instruments,** possibly including airborne radar for all-weather round-the-clock operations;
- **Improved local weather forecasting,** including forecasts of smoke conditions.
- **More study of the economic aspects** of potential routes, which may largely determine actual helicopter specifications.
- **A program of accelerated flight testing** of new machines under simulated airline conditions.

"Cities which want helicopter services may want to keep this desire in mind when building new car parks or public garages," Dyment added. "The rooftops of these buildings would be ideal for heliports in many instances and it will be important to have them ready in time.

IATA experts are now preparing a full report on the symposium, which will be published as a "bible" on transport helicopter operations. If such a symposium had been held when fixed-wing transports were in a comparable state of development, there is little doubt that the jet age would have arrived years ago—and that we would now be well into the helicopter age.

• • •

On the Cover: The Helicopter's Pioneers

THE COVER symbolizes the growth of the helicopter industry—in the center, the dean of the U. S. school of rotary wing design, surrounded by four of the industry's "bright young men" who founded their own companies, each based on a new rotor theory, and built them into important segments of America's aircraft industry.

• **Center: The dean, Igor I. Sikorsky,** born in Kiev, Russia, on May 25, 1889. Sikorsky graduated from the Naval College at Petrograd in 1906 and went to Paris to study engineering; later returned to Kiev where he entered the Mechanical Engineering College of the Polytechnical Institute. He began his work in aviation by designing and constructing a 25-horsepower helicopter in 1909, which was unsuccessful because of the inadequate power.

In the next three decades Sikorsky designed, built, and flew a number of fixed-wing airplanes, but in 1939 he returned to his first love, the helicopter, with the VS-300 design, generally accepted as the beginning of the U. S. helicopter industry.

• **Upper left: Charles H. Kaman,** 33, who graduated from Catholic University in Washington, D. C., in 1940. He went to work for the Hamilton Standard Division of United Aircraft Corp. and remained with that company until he organized Kaman Aircraft Corp. to pioneer the intermeshing rotor type of helicopter.

• **Upper right: Glidden S. Doman,** 32, who graduated from Michigan University with an aeronautical engineering degree. He served briefly with Aircooled Motors, Inc., where he worked on helicopter engine development, then joined Sikorsky Aircraft Division where he became chief stress engineer. He left Sikorsky in 1945 to form Doman Helicopters, Inc., and develop the hingeless rotor system.

• **Lower left: Stanley Hiller, Jr.,** 29, a graduate of the University of California, who started research on a new design for a stable helicopter in 1939 and developed his "Rotormatic Control." He flew his first helicopter, the XH-44, in 1944.

• **Lower right: Frank N. Piasecki,** 33, who studied mechanical engineering at Pennsylvania University, later graduated with a B.S. in aeronautical engineering from New York University's Guggenheim School of Aeronautics. Piasecki had early (pre-college) training with Kellett Autogiro Co. and Aero Service Corp. Upon graduation he joined Platt-Lepage Aircraft Corp. as an aircraft designer. In 1940 he originated a rotary wing experimental group which was incorporated in 1943 as the P-V Engineering Forum.

That same year Piasecki flew his first helicopter, the PV-2, which, curiously enough, was a single-rotor plane. Piasecki was president of Piasecki Helicopter Corp., which now builds tandem-rotor helicopters for all three military services, until he became chairman of the board in 1949.

Members of Helicopter Council attending recent meeting are, from left to right, L. Welch Pogue, legal advisor; J. P. W. Vest, Washington representative, Sikorsky Aircraft; M. R. Brown, assistant to the chairman of the board, Piasecki Helicopter; L. S. Wigdortchik, special projects engineer, Piasecki; Harvey Gaylord, retiring council chairman and vice president and general manager, Bell Helicopter; Charles H. Kaman, president, Kaman Aircraft; Stanley Hiller, Jr., president, Hiller Helicopters and council vice chairman; Charles Kirchner, assistant to the president and public relations director, Kaman; Charles R. Wood, Jr., helicopter sales engineer, McDonnell Aircraft; B. L. Whelan, council chairman elect and general manager, Sikorsky Aircraft; Ralph Lightfoot, chief of aerodynamics and flight research, Sikorsky; E. M. Benham, public relations director, Sikorsky; F. N. Piasecki, chairman of the board, Piasecki; Glidden S. Doman, president, Doman Helicopters; C. E. Blandford, Washington representative, Hughes Aircraft; Don Ryan Mockler, director, Helicopter Council, Aircraft Industries Assn.; and James B. Edwards, chief engineer, Hiller.

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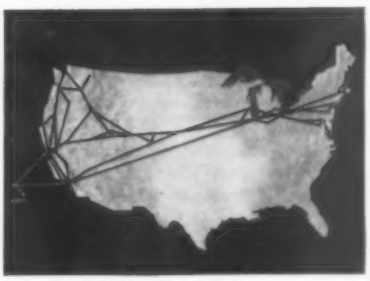

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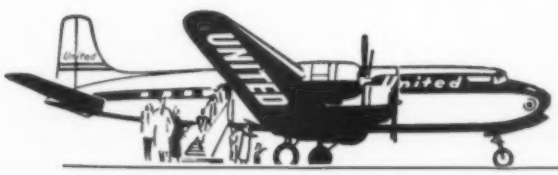

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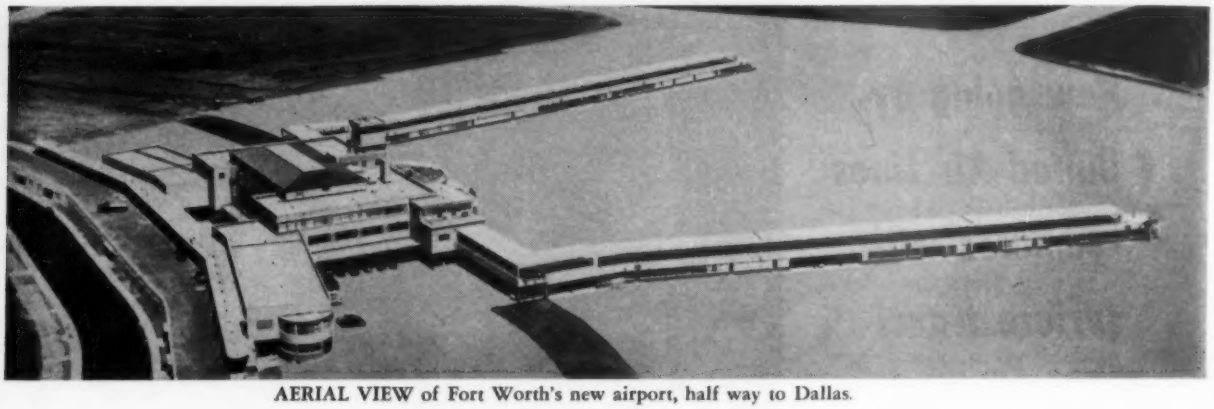

AERIAL VIEW of Fort Worth's new airport, half way to Dallas.

Amon Carter Field: One of World's Finest

Experts call planning, design features nearest perfection for any field in its class; termed civic triumph.

By WAYNE W. PARRISH

THE NEW Amon Carter Field, Greater Fort Worth International Airport, opened for business on April 26.

Fort Worth can rightfully lay claim to having the finest terminal building in the world. From all standpoints the airport represents the nearest thing to perfection in planning, in design, and in functional layout, of any airport in its class anywhere. Experts who have seen airports all over the globe used superlatives while inspecting the project.

Huffman

It also represents a tremendous civic victory for Fort Worth. For many years efforts were made to persuade Dallas and Fort Worth to join hands on a project midway between the two cities. Dallas held back. So led by its first citizen, Amon Carter, Fort Worth went ahead anyway, and the results are something to make Dallas take a back seat. There is no question whatever that the new airport, 17 miles from the heart of each city, will attract airline business from Dallas' Love Field and may become, in time, the long desired two-city midway airport.

It's a $13,000,000 project, of which $4,000,000 went into the terminal building. It is the nucleus of an all-inclusive city. Already it has its own exclusive telephone exchange (properly designated AIRPORT, TEXAS).

• **The property,** incorporated into the city of Fort Worth, comprises 1,780 acres. It is capable of being greatly expanded without disrupting present construction and designs. It will have a complete shopping center, a hotel, a recreational area for employees, and many other features, all within the airport property.

• **It is zoned** for a radius of five miles. Present plans call for all approaches to be clear on a 50:1 or a 100:1 glide angle. There are no utility poles of any kind on the property. All power and telephone cables are in underground conduits. Even the water system is an underground pressure system.

• **The main runway** (northwest-southeast) is 6,400 feet long and 200 feet wide, with provisions to extend to 12,000 feet if required. All necessary property for expansion has already been purchased. The north-south runway is 6,400 feet long and 150 feet wide. Both runways are nine-inch reinforced concrete on a 24″ prepared sub-base. A third runway is 4,100 feet long.

• **A runup pad** at the end of each runway permits five four-engine airplanes to run up their power plants simultaneously. Regardless of which craft is given initial take-off clearance, that plane can become airborne without being hampered by another plane in front. The main runway is equipped with high intensity runway lights (Westinghouse), with high intensity approach lights 3,000 feet from the runway and on the center line.

• **Seventeen four-engine aircraft,** or 20 to 21 mixed types, can be loaded and unloaded simultaneously along the two passenger loading fingers. The loading aprons can be expanded to accommodate 32 four-engined or 36 mixed type aircraft. The loading apron and all taxiways are 11″ reinforced concrete.

• **Gas trucks will be absent.** The finest underground gasoline distribution system (non-commingling) moves fuel from twelve 25,000-gallon underground tanks through 3,000 feet of mains to hydrants located at each parking position on the ramp. There are 68 hydrants, and the system can accommodate jet fuel or higher octane gasoline when conditions demand. Allied Maintenance Corp. operates the fueling system as well as cleaning, skycaps, and other services. Air conditioning outlets for cool and warm air are at each ramp position. Ramp equipment is kept to a minimum and all utilities are underground.

• **Driving time** to downtown Dallas or Fort Worth is 30 minutes by existing highways, but the new freeway which will come to within two miles of the airport will reduce travel time to less than that now required from either Meacham Field (the former main Fort Worth airport) or Love Field. There is a garage accommodating 200 cars on the lower level.

• **The airport is being operated** by Fort Worth Air Terminal, Inc., Amon Carter, president, a corporation composed of 23 bankers and businessmen of Fort Worth who subscribed the capital stock and set up the corporation as a civic venture. The corporation leased the airport from the city for a period of 36 years. The airport will be operated as a business by businessmen for the benefit of the traveling public. Maury H. Huffman is executive director.

• **The terminal building** contains 242,000 square feet of floor space (more than five acres), with future expansion planned for 500,000 square feet. It is air conditioned for winter and summer and has a two-level operation to segre-

gate passengers and baggage, air mail, air freight and air cargo. It has one of the largest traffic control towers in the country.

• **In one wing** there are 208 linear feet of airline ticket counters, only a few feet from the vehicle ramp. In another wing, equally close to the vehicle ramp, is a 100-foot baggage claim counter. There is ample parking facility, planned eventually for 7,700 cars.

• **Central feature is a lobby** 180 feet long by 60 feet wide, 10,800 square feet, with a ceiling 31 feet high, furnished with custom built furniture, giving the appearance of a modern hotel lobby rather than a railroad station. There is no airline function in this big lobby. On the east wall is a bas-relief featuring the State of Texas, by James Buchanan Winn of Wimberly, Texas, all covered with an acre of 18½ karat gold leaf.

• **Concessions,** ranging from a western gift shop to a drug store, are all off the main lobby. So is the circular dining room seating 225 people, carpeted and terraced in two levels so that every diner will have a full view of the field operations. There is also a coffee shop. Sky Chefs has the food concession. The dining room is the finest, from all standpoints, of any airport anywhere.

• **A carefully designed public address system,** with a center control room viewable by the public, has 499 loudspeakers placed scientifically so that announcements and music can be heard anywhere without strain. This is the finest and most extensive setup to be found anywhere—a new era of public address systems. Five specially trained girls comprise the speaking staff.

• **There is a large spectator's gallery,** seven escalators for access from plane

COMMUNICATIONS CENTER feeds announcements into 499 loudspeakers.

PASSENGERS BOARDING PLANES enter terminal at right end, where ticket offices are located. At left end of building passengers claim baggage.

gate to passenger concourse, ladies' and children's aid room with hostess on duty, ample rest rooms and shower baths available, a barber shop and a beauty parlor, employes' cafeteria, private dining rooms, and ample offices for CAA, Weather Bureau, airlines, city offices, and others.

• **American Airlines** has opened an Admirals Club, the finest one built to date, in which there is a collection of western paintings valued at $106,000. In the Amon Carter suite, for use by VIP's and corporation officials, there is a $100,000 collection of Remington and Charles Russell paintings, plus ultra-smart and ultra-plush decorations.

All in all the terminal is breath-taking, and there are many features not mentioned above which point to extensive and intelligent planning.

The architects were Joseph R. Pelich and Preston M. Geren. The consulting engineer was Wyatt G. Hedrick, Inc., and the interior decorator was Robert D. Harrell, Inc., of Los Angeles. The sound system consultant was Wayne Rudmose of Dallas. Mechanical and electrical consultants were Yandell, Cowan and Love of Fort Worth. Thos. S. Byrne, Inc., built the terminal building.

Eighty-three schedules per day are now being operated by American, Braniff, Delta, Central, Pioneer, and Trans-Texas. Many of these are continuing to stop also at Love Field, about 14 miles away.

Secretary of the Air Force Harold E. Talbott gave the principal address at the dedication April 25. Amon Carter, publisher of the *Fort Worth Star-Telegram,* was unable to be present but witnessed the ceremonies on TV at his home, where he is recovering from a stroke suffered recently. Airline presidents and representatives of airport and other groups were present.

Although the airport has 6,000 square feet of air-conditioned space set aside for the postal service, the Post Office Department advised Fort Worth a few days before the opening that it intended to remain at Dallas for the time being, but Fort Worth hopes to lure the postal service to its new port shortly.

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NEWS BRIEFS

CAA has released **103 airport projects** of more than 100 "frozen" by the Budget Bureau last February. Civil Aeronautics Administrator Fred B. Lee has said that the re-examination would continue until all projects have been reviewed. **A few projects have been disapproved,** but the names of the cities involved will not be released until a later date.

• •

Eastern Air Lines is celebrating its **25th anniversary** this month and doing some reminiscing. Sample: first month's operating revenues, in May, 1928, were $25,710.37, all from the Post Office for carrying mail from New York to Atlanta. Deficit for the first year: $6,807.87. By now Eastern can afford to reminisce; **last year's operating revenue:** $118.5 million.

MALAYA—Sikorsky S-55 and S-51 helicopters have strengthened British forces in Malaya, where their ability to operate without prepared landing fields is particularly valuable, in the struggle against communist guerrillas. Here a group of S-55s flies in review at the Royal Navy Air Station, Gosport, England, before embarking for Malaya on a British aircraft carrier. They were supplied under terms of the Mutual Defense Assistance Program.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS

KOREA—A mine-spotting Navy Sikorsky HO3S helicopter takes off from its floating base on the deck of an LST somewhere off Korea. From a hovering position, its pilot can spot submerged mines not visible from shipboard. With helicopter-minesweeper teamwork, safe channels can be cleared quickly, and danger reduced to a minimum.

LABRADOR—Pilots of Marine Air Group 26 gave their HRS Sikorskys a workout over the bleak Labrador coast recently in training maneuvers. Specialized tactics, made possible by the extreme mobility and utility of helicopters, were tested in ship-to-shore operations. The Sikorskys were based on the aircraft carrier U.S.S. Kula Gulf.

HOLLAND—When the raging North Sea inundated lowland areas of Holland and England, thousands of victims were carried to safety by helicopters from American, British and Dutch military units. Sikorsky S-55 and S-51 types again demonstrated helicopter versatility, rescuing victims from the flood and bringing in relief supplies. Here an R.A.F. S-51 lands on a road isolated by the flood.

SIKORSKY AIRCRAFT

BRIDGEPORT, CONNECTICUT

One of the Four Divisions of United Aircraft Corporation

A MILITARY COMMENTARY . . .

Peace: Cheap at Half the Price

REPORTS from the Pentagon have it that Defense Secretary Charles E. Wilson, with Administration backing, plans to hack $5 billion off the defense budget, without, of course, jeopardizing the national defense.

If he can do it, it will be a truly monumental achievement. We are prone to wonder, however, just how a sum of that size can be sliced out of the budget without impairing some portion of the approved programs.

The members of the former Administration stated repeatedly that the budget they prepared was a "tight" one. It could, of course, hardly have been expected of them to admit it was a loose budget; they were naturally somewhat enamored of their own handiwork. Nonetheless, from all the evidence available, it appeared at the time the budget was submitted that they had really prepared a tight budget.

They apparently overlooked a few billion dollars worth of useless equipment and services which Mr. Wilson and his staff were able to find under the new Republican microscope. Or it could be that, unencumbered as they were with the responsibilities of a brand new Administration, they prepared their budget with defense requirements uppermost instead of the attractive possibility of a tax cut which will endear the GOP to the hearts of the American people?

There is no question that $5 billion can be cut from the defense budget, but there is considerable question that it can be done without jeopardizing defense.

Any substantial cut will almost certainly mean a new stretch-out of, for instance, the 143-wing Air Force program. A clue to this belief lies in the President's statement: "This policy of ours will not be tied to any magic, a critical year which then has to be stretched-out, because of economic or production problems, but will be based on the sounder theory that a very real danger not only exists this year, but may continue to exist for years to come."

We can remember when the "critical year" was 1952. As it turned out, it was not so critical; the calculated risk lucked out. The current attainment date of the 143-wing Air Force is January 1, 1956. The forthcoming budget cut will probably stretch that at least a year, extending the period of calculated risk. This may not be jeopardizing national defense—if our luck holds out. But if we can count on our luck holding indefinitely, we might as well cut $20 billion out of the budget instead of five.

Despite the Russian "peace offensive" (and it might be pointed out that the new budget was in preparation before the Russians got friendlier, thus the international situation has nothing to do with the cut) there are certainly no indications that the time is ripe for a cut in defense appropriations. The current economy wave is faintly reminiscent of the days when Louis Johnson charged about the Pentagon waving his machete at every defense expenditure in sight. No need to enlarge on how that worked out.

And while on the subject of economy, it might be well to reflect on the fiscal 1954 budget of the National Advisory Committee for Aeronautics, which has just taken a terrific shellacking in the House and which, it appears, will get the same treatment in the Senate.

NACA's total budget was less than $65,000,000 in the original request, hardly a staggering sum for one of the most important of all the government agencies. Yet the savants of Capitol Hill decided it could be cut by more than 20%.

The budget for construction of new facilities took the sharpest edge of the axe. An original request for $14,600,000 was chopped to a little over $4,500,000. The solons decided that there was no need for a new rocket research facility, no need for modernization of a wind tunnel, no need for a proposed supersonic tunnel nozzle. We wonder how many of the voters knew what a supersonic tunnel nozzle is.

Top Administration leaders recently have been saying that we are not going to fight tomorrow's wars with yesterday's weapons. We wonder where they think we will get tomorrow's weapons.

There must be an awful lot of painstaking research before tomorrow's weapons materialize. NACA's basic research work is years in advance of actual military prototypes and we should be expanding, not cutting, in this area of advanced research. It is more important today than ever before, as we approach the era of high supersonic flight and the day of the guided missile, for these very high speeds present problems of a magnitude that dwarfs the problems of building today's subsonic jets.

There can be no rational arguments advanced for the cut in NACA appropriations. It is just another example of the Administration attitude that all government agencies are spendthrifts (certainly a justifiable stand in some cases) and therefore must be cut. A Republican-led committee would lose face if it had to admit that a Truman-prepared budget could not be cut.

We paid a recent visit to NACA's Ames Aeronautical Laboratory at Moffett Field, Calif., the aerodynamic research center, and we were very much impressed by the very small staff with which the laboratory operates. Yet what staff there is must certainly operate at a very high degree of efficiency. We feel sure that both the military and the aircraft industry will testify to the amount of work the laboratory gets done.

The same personnel paucity we have noted on previous visits to NACA's other labs, Langley Aeronautical Laboratory at Hampton, Va., and Lewis Flight Propulsion Laboratory at Cleveland. Certainly the accomplishments of these laboratories have been completely out of line with the minimum personnel employed and the scanty appropriations granted them.

If this almighty $13,000,000-plus budget cut is an example of the type of "economy" we are going to get, we would like to go back to the old spendthrift days.

. . . JAMES J. HAGGERTY, JR.

MARTIN B-26C 16-passenger conversion by AiResearch for Tennessee Gas and Transmission Co. has exterior configuration changes, including long dorsal fin, pointed tailcone, and large picture windows behind wing's trailing edge.

B-26 Becomes Plush Corporate Aircraft

THE FIRST of two conversions of the Martin B-26 Marauder has been completed by AiResearch Aviation Service for the Tennessee Gas Transmission Co. of Houston, Texas. Design changes and modifications converted the medium attack bomber into a 16-passenger, high-speed executive aircraft, complete with luxury interior.

Two R288-83AM3 engines have been installed, which give 2100 take-off horsepower without water and provide a cruising speed close to 300 mph. About 75% of the airframe has been changed by complete rewiring, modification of wings for nylon fuel cells, and installation of a new hydraulic system including flaps, landing gear, and an emergency system. Two 100,000 BTU heaters have been installed.

Major exterior changes encompass a long straight dorsal fin, reaching almost the length of the fuselage, and a long pointed tailcone. Elliptical picture windows have been set in just behind the wing's trailing edge.

The cabin has been divided into three sections: the rear section seats 10; the center seats six; and the forward compartment is the entrance vestibule, which has been fitted out with a buffet, storage space, clothes closet and lavatory. A main baggage compartment has been built in the tail section.

The pilot's compartment has been equipped with a new radio and instrument panel.

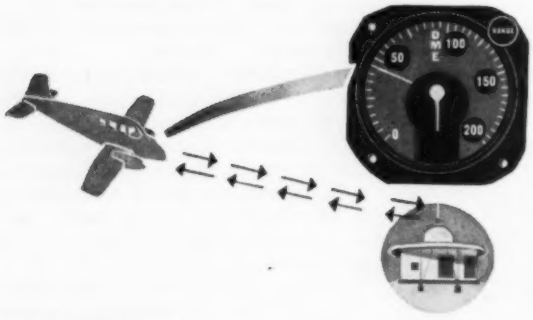
Tennessee Gas and Transmission Co. received a special waiver from the Civil Aeronautics Board to operate the B-26C, since the military safety record of the aircraft "had not been such that certification can be approved by the Administrator under present interpretations of (CAR) Part 9." The waiver, granted in March, 1952, was to become valid after the applicant's proposed modifications were accomplished. • • •

HORSESHOE-SHAPED couch has been placed against rear bulkhead in rear section, where the tailgunners used to be during the aircraft's life as a medium bomber. Couch, which seats six, is part of 10-passenger lounge.

PERMANENT SEATING group in rear lounge is set around an elliptical table, with storage cabinets serving as lamp and ash tray supports (left). Center cabin area (right) was formerly the bomb bay, now is equipped with two swivel chairs and a four-place divan, which can be used for sleeping when armrests are removed.

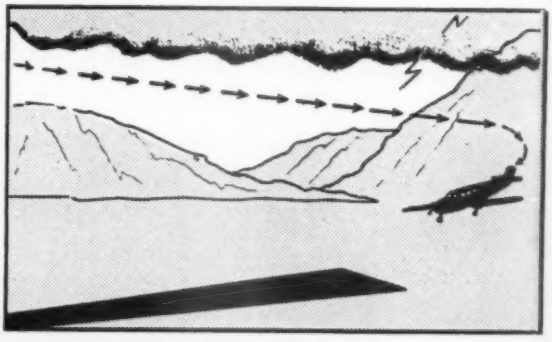
ACCURACY OF BENDIX OPERATING COSTS FOR

You can figure out the savings yourself. Find out what it costs to operate your company aircraft for one hour. Find out how many hours it flies in a year. Then calculate how much Bendix Distance Measuring Equipment can reduce operating costs . . . even if DME saves you only one minute per hour! Here is a navigational aid . . . that produces *provable* savings in fuel consumption, more accurate ETA's, better holding procedures, expediting arrivals and departures, etc.

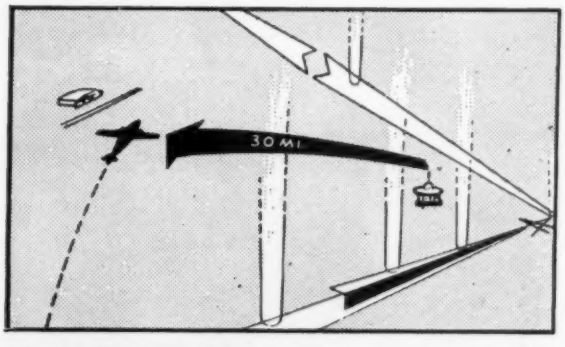


HOW IT WORKS Ground and airborne equipment work together in DME. The airborne receiver-transmitter is known as an interrogator. The ground station, always located at a VOR site, is known as a transponder.

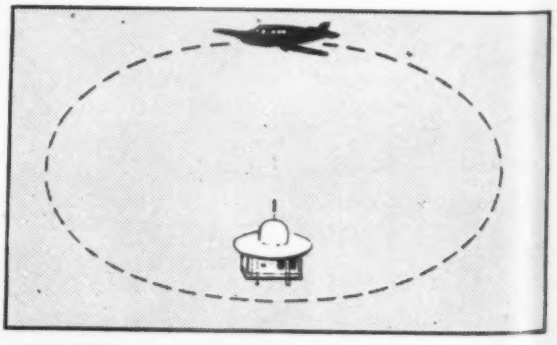
The interrogator in the plane radiates a series of radio pulses. They are received at the ground station . . . where they trigger the ground transponder. This in return transmits a reply to the plane. The elapsed time, in micro seconds, is used to compute automatically the slant distance between the plan and the ground station. The pilot simply reads the exact distance on the panel indicator.



INSTRUMENT APPROACHES TO FIELD To the operator of executive or corporation type aircraft, the advent of Bendix DME equipment means that many small airfields which are within receiving range of a VOR/DME but are not served by scheduled carriers and normally difficult to approach on instruments, will now be open to him. DME equipment in conjunction with VOR equipment provides the pilot with continuous accurate direction and distance information without time consuming triangulation or mathematical calculations.

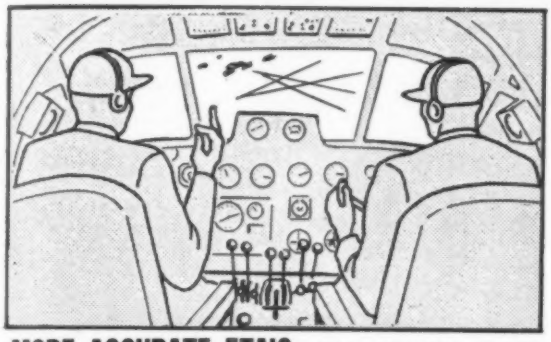


UNMARKED AIRWAYS Pilots of corporate aircraft will be able to navigate along new and unfamiliar routes with greater accuracy and with more confidence under IFR conditions. They will not have to fly standard airways which often adds many miles to the trip. Here's another DME saving in fuel and time.

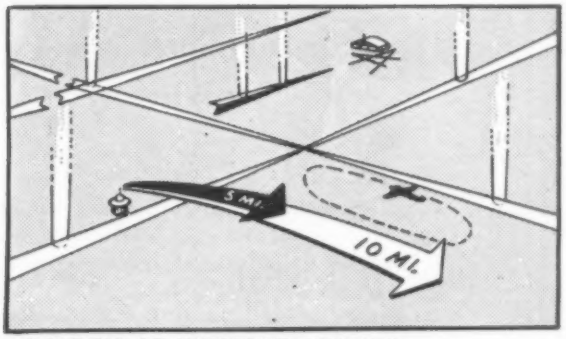


ORBITING Regardless of wind conditions, a pilot is now able to fly an accurately controlled circular course. This exact arc can be flown around a DME/VOR at selected distances from the station and at varying altitudes. This expedites departures and arrivals. It bypasses holding stacks at intersections. It all saves time, fuel and money.

DME MEANS REDUCED EXECUTIVE AIRCRAFT!



MORE ACCURATE ETA'S The Bendix DME allows the pilot to estimate arrival times more accurately. Flight tests prove that a pilot with DME on his instrument panel can correct for headwinds, tail winds, etc. By simple calculation he always knows his ground speed. Whatever the change . . . the pilot can adjust his power to maintain his promised ETA. Accurate ETA's reduce holding and altitude-changing along the airways. They reduce wasteful time separations. Save time, money and increase passenger convenience.



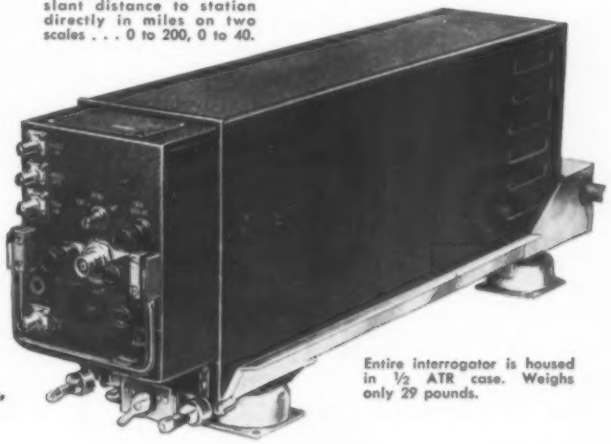
HOLDING AT UNMARKED POINTS With Bendix DME, aircraft can now hold at any point within range of a DME/VOR station. No longer limited to range intersection facilities or homing airway markers. Patterns can be tighter, closer in, more accurately executed. Holding can now be on actual distance covered, not on elapsed time. No more need for wasteful wide-area "Buffer Zones."

DISTANCE MEASURING EQUIPMENT (DME) has long been wanted by the aviation industry to provide rapid, precise determination of the location of aircraft in flight. As its name implies, distance measuring equipment electronically computes the distance of an aircraft from a specific combined DME/VOR (Visual-Omni Range) station and presents the numerical value on an indicator calibrated directly in miles. This mileage reading, when combined with the lateral directional information from VHF Visual-Omni Range stations, provides the pilot with simultaneous distance-plus-direction data . . . all that is required to immediately and accurately pin-point his position. Bendix Radio now offers the aviation industry the finest in Distance Measuring Equipment . . . designed to insure precise, reliable navigational information in high intensity areas and under the most adverse weather conditions.

Write to Bendix Radio, 2120 N. Charles Street, Baltimore 18, Maryland.

Cockpit indicator reads slant distance to station directly in miles on two scales . . . 0 to 200, 0 to 40.

The DME antenna is about the size of a pack of cigarettes. It can be installed anywhere in the aircraft.



Entire interrogator is housed in ½ ATR case. Weighs only 29 pounds.

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Great Airlines from Little Airlines grow

and become GREAT assets to the commercial and military might of our Nation!

UNITED AIR LINES of Denver is one of the finest examples of such dynamic development. For United began back in 1926 and 1927 when four small independent airlines were formed backed only by private capital and the stern determination to render a vital new service to the Nation and its citizenry.

It was then that such pioneering airmen as Walter T. Varney, founder of Varney Air Lines, began flying mail from Pasco, Washington to Elko, Nevada in single engined biplanes. Another was Vern C. Gorst, founder of Pacific Air Transport, who with open cockpit Ryans flew the mail from Seattle to Los Angeles in the unprecedented time of 14 hours. With stubnosed Curtiss Falcons, National Air Transport began regular trips between Fort Worth, Chicago, and New York, connecting with the Boeing Air Transport's Chicago-San Francisco run. During those days coast to coast travel over these United Airline predecessor companies required 31¾ hours!

Today, fifty years after the famous Wright Brothers first flight at Kitty Hawk, North Carolina, United Air Lines serves 83 cities from Boston to Honolulu, from Vancouver to San Diego. United spans the nation daily in only 11 hours with modern streamlined DC-6's!

Thus, on the golden anniversary of powered flight, North American Airlines, an independent carrier pioneering air coach in today's tempo, congratulates United Air Lines and its management for its contribution in the development and growth of the Nation's air transport industry under the American free enterprise system.

(First in a series—"Following the Trail of the Pioneers")

NORTH AMERICAN AIRLINES

First in Air Coach

Daily Utilization

Average Revenue Hours of Use Per Day Per Aircraft for All Types of Service

Domestic Carriers

		Quarter Ending Dec. 31, 1952
American	2 eng. pass	6:39
	4 eng. pass.	9:32
	cargo	4:38
Braniff*	2 eng. pass.	6:23
	4 eng. pass.	8:23
	cargo	5:32
Capital	2 eng. pass.	6:29
	4 eng. pass.	8:29
	cargo	7:55
Caribair	2 eng. pass.	4:07
	cargo	6:00
C & S	2 eng. pass	9:07
	4 eng. pass.	9:37
Colonial	2 eng. pass.	6:22
	4 eng. pass.	8:34
	cargo	5:40
Continental ..	2 eng. pass	6:38
	4 eng. pass.	5:30
Delta	2 eng. pass.	8:01
	4 eng. pass.	9:09
	cargo	7:08
Eastern	2 eng. pass.	6:59
	4 eng. pass.	9:29
	cargo	1:41
Hawaiian	2 eng. pass.	5:09
	cargo	5:11
National	2 eng. pass.	7:35
	4 eng. pass.	9:04
	cargo	6:29
Northeast	2 eng. pass.	5:42
Northwest ...	2 eng. pass.	8:10
	4 eng. pass.	8:55
	cargo	7:22
Trans Pacific .	2 eng. pass.	6:17
TWA	2 eng. pass.	2:31
	4 eng. pass.	7:38
	cargo	4:06
United	2 eng. pass	5:25
	4 eng. pass.	8:02
	cargo	4:55
Western	2 eng. pass.	7:40
	4 eng. pass.	8:35

**Figures do not include operations of local service route 106 operated by Braniff as result of MCA merger.*

Weed Killer Melts Ice

A weed killer which has three flame-shooting spouts is an excellent machine to have around the airport, according to Robert M. Howard, manager of the Hillsgrove (R. I.) Airport.

In winter, a sanding device is attached to the machine and the flames melt the icy runways sufficiently to provide a sandpaper surface on which aircraft can get proper traction for braking and turning purposes. If the icy surfaces are not melted slightly, the sand will blow away.

VICKERS UNIT calibrates jet engine controls.

Jet Engine Simulator Developed

Vickers, Inc., has announced the development of a simulator which permits more accurate calibration of jet engine controls at a considerable saving in cost over present methods. The device is being produced by Vickers under an estimated $500,000 contract with the U. S. Navy Bureau of Aeronautics, and first deliveries are expected late this year.

Methods used in the past for calibrating jet engine fuel control systems have been of a static nature, with costs often running as high as $5,000 per engine in fuel consumption, engine wear and tear, etc., and without the assurance that a good "flying" system would result. The Vickers' simulator brings dynamic testing to the engine test cell by duplicating the actual conditions the components encounter in flight, and reduces the costs to about two per cent of their former value.

The unit is made up of a 100 hp variable speed hydraulic transmission to drive the fuel control unit, a d-c generator and Potter flowmeter, which feed shaft speed and fuel flow information into an analog computer, and the computer itself, which is designed to duplicate the many variables encountered in engine flight operation. The computer electronically "sums" the speed and flow data received from the instrumentation and records and displays the resulting performance of the unit under test, for direct comparison with the fuel equilibrium curve of the engine.

A production model of the simulator will be designed for a specific model engine, but plug-in type components of the analog computer will permit quick changeover for its use on other engines. Aside from testing present systems, the simulator will aid engine and fuel control manufacturers in developing and testing new control systems before they are installed on prototype engines.

Although first deliveries are slated for the Navy, Air Force interest in the device is evident, according to Vickers. However no production order has been placed by the USAF to date.

Contract Slump Hits PAC Skilled Labor

Pacific Airmotive reports that it has laid off 47% of its skilled labor in the past few months because military contracts reached their lowest point since Korea. PAC's president, Thomas Wolfe, expects another peak, however, if Congress passes the fiscal 1954 budget which calls for tripling expenditures for overhaul work by private companies. Although military work dropped off, PAC's commercial business increased 54.3% last year and accounted for 48.5% of its total sales because of "maintenance of the fast growing corporate aircraft fleet . . ."

2nd International

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JUNE 9, 10, 11, 1953

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New Products
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What JACK & HEINTZ *is doing about...*

Tomorrow's higher speeds and altitudes create aircraft and accessory cooling problems—at Mach 3, inlet air temperatures rise about 700°F., skin temperatures 600°F.

This means entirely new concepts in aircraft engineering design and development.

The Thermal Barrier, encountered by planes flying in the stratosphere at supersonic speeds, offers a perplexing paradox. The temperatures outside the plane range down to a frigid -67°F. Yet the air from the outside conducted into the plane's electrical equipment, for cooling purposes, is hundreds of degrees too hot to be effective—as the result of pressure and friction created by the plane's terrific speed through the rarefied air.

On military aircraft designed to operate at speeds of more than 2,000 mph and at altitudes approaching 100,000 feet, the attainment of adequate cooling and trouble-free commutation of rotating electrical equipment will become increasingly difficult.

To meet the trend toward ever increasing speeds and altitudes, Jack & Heintz engineers are continuing to develop new higher altitude, higher speed equipment. Some of this is completely environmental-free.

For example, we have a group of new,

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the THERMAL BARRIER

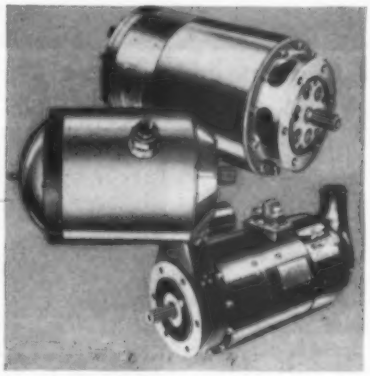
high-altitude motor generators, designed with improved insulation, larger commutators and staggered brushes resulting in reduced brush temperatures, and greater air flow over the commutator. Our new FRS-1 Control is used for the first time on these motor generators. Simplified yet extremely close voltage and frequency control is obtained with this FRS-1, a unit performing functions formerly requiring two controls.

For aircraft generator requirements, we have developed environmental-free units completely independent of altitude or speed and incorporating new concepts in the cooling of electrical equipment.

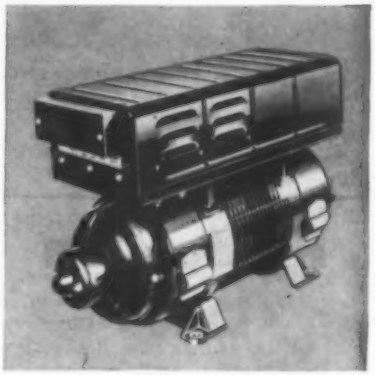
J&H Model G75 a-c generator is the first in the industry to incorporate a cooling system utilizing the vaporization of water.

Another generator, our Model G37, is cooled with a chemical coolant, circulating in a closed recirculating system. J&H Model G38, while still a blast-cooled unit, can be considered environmental-free, since it incorporates a cooling method utilizing bleed air from the pressurized cabin.

NEW IMPROVED COOLING METHODS INCORPORATED ON J&H EQUIPMENT



Top to bottom, G37 Generator, G75 Generator and G38 Generator



J&H Model F137 Motor Generator

J&H looks to the Future

To the designer of electrical accessories, higher speed and altitude requirements pose new problems. But, with a recently completed altitude chamber, engineers at Jack & Heintz can now determine in advance of flight test how their equipment will behave at the super-high altitudes of the future. Designed and built by J&H personnel, the altitude chamber will permit complete Air Force qualification tests, duplicating the temperature, air flow, atmospheric pressure and humidity characteristics of altitudes up to 100,000 feet. Although the chamber has been basically designed to test electrical-rotating machinery, it is readily adaptable for testing mechanical, pneumatic, hydraulic or other types of aircraft accessories.

You can possibly draw on the design and development experience of Jack & Heintz in helping to solve the high-speed, high-altitude problems we are all facing. Write Jack & Heintz, Inc., Department 501, Cleveland 1, Ohio.

Rotomotive EQUIPMENT

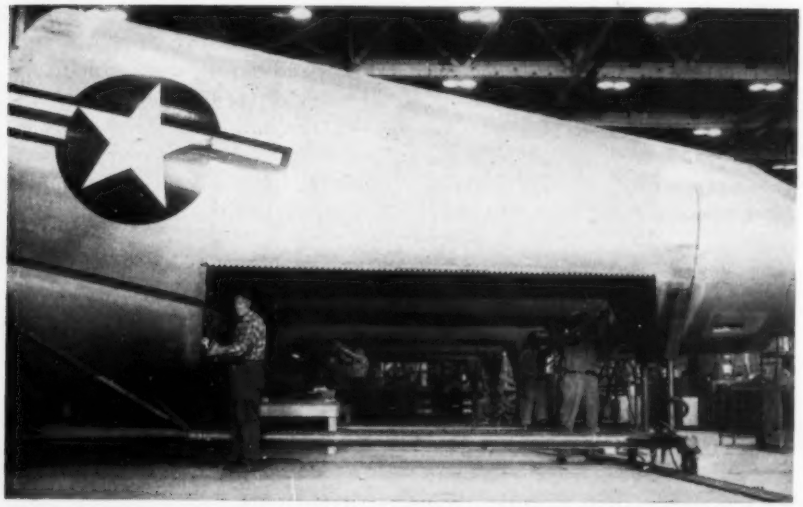
© 1953, Jack & Heintz, Inc.

Aircraft Generating Equipment—a-c and d-c—including Control Systems and Components • Electric Starters • Actuators and Special Aircraft Motors • Custom-built Commercial Motors • J&H Eisemann Magnetos

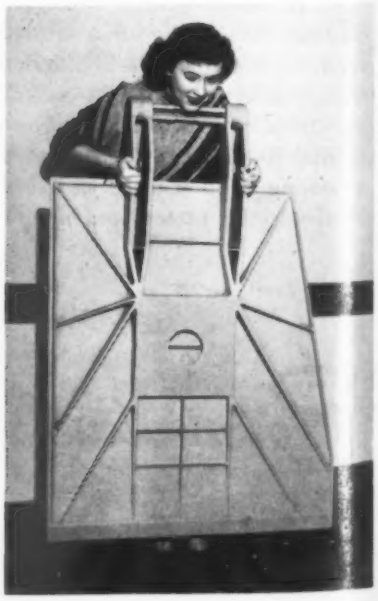
Horseshoe-shaped final assembly area is used by Boeing in construction of C-97 Stratofreighters at its Renton, Wash., plant. Method avoids lost motion of workers.

Production Lines

Old machine tools, worn out from use during World War II, are being rebuilt by Boeing. Need for the tools forced Boeing itself to set up the program when tool manufacturers were too busy with new orders to give quick service. Average cost: 20% of 1942 list price.



Ryan Aeronautical is building aft fuselage sections for the Boeing C-97 at a record pace of five at a time, following reorganization of facilities.



Lightweight speed brake of the Chance Vought F7U-3 Cutlass, hoisted by Miss Bette Harvey, at right, is made of cast magnesium.

Navy Cancels Ford Jet Engine Contract

The Navy has cancelled its $154,000,000 contract with the Ford Motor Co. to build Westinghouse-licensed J40 jet engines at a Navy-owned, Lincoln-Mercury-operated plant at Romulus, Mich.

Expected to be ready for production within three months, the $50 million facility will be completed "as a Navy industrial reserve unit," according to Rear Adm. T. S. Combs, head of the Bureau of Aeronautics who gave as the reason for cancellation: "changes in Navy requirements."

February Saw Drop In Aircraft Shipments

Complete civilian aircraft shipments for February amounted to 832,300 airframe pounds valued at $17,100,000, according to a joint report made by the Bureau of Census and the Civil Aeronautics Administration, showing a six per cent drop in poundage and $600,000 less than that of January. Unit shipments for February, however, were up to 382, compared to January's 365.

February engine shipments also declined slightly from those of January, with 476 engines totaling 188,000 horsepower being shipped, compared to 583 engines totaling 267,800 horsepower, a decrease of 18% in number and 29% in horsepower.

Jet Center Contracts

Lockheed Aircraft Corp. expects construction of three factory buildings at the Air Force's new jet test center at Palmdale, Calif., to be completed in about 10 months, having awarded contracts approximating $3,200,000 for construction.

PHOTO CREDITS

Chance Vought, p. 17; Convair, 2[illegible] Boeing, 22-23; manufacturers, 3[illegible]4-35; Avipix, 36; Aircraft Industries Assn., 38; Bell, 40-41; Aireser[illegible]ch, 45; Boeing, Ryan, Chance V[illegible]ght, 52; Caterpillar, 56; National Bureau of Standards, 58.

Correction

Martin 2-0-2, 2-0-2A, and 4-0-4 fuel capacity (AMERICAN AVIATION, April 27, p. [illegible]) was erroneously listed as 6060, 8100 and 8100 gallons, respectively. These figures represent fuel capacity in pounds; fuel capacity in gallons for the three airplanes is 1010, 1350, and 1350.

West Coast Talk

By Fred S. Hunter

OVER in Las Vegas there is an air of eager expectancy over the purported plans of Howard Hughes. These are, as usual, strictly hush-hush. This is recognized in Los Angles as Hughes' customary policy of maintaining deep silence until he decides a propitious time has arrived to let the public in on the news. But Las Vegas counts this secrecy as being highly significant.

Las Vegas has learned that Hughes has acquired several thousand acres of land on the edge of town. It reports he is negotiating for several thousand more acres adjoining. Hughes himself has spent most of the winter at the plush Nevada resort. A string of a dozen rooms or so at one of the swankier casino-hotels has served as offices as well as living quarters. The Convair 240 he leases from Consolidated Vultee has been kept at the field for his use.

All this, to the Las Vegas folk, adds up to something big. A Las Vegas newspaper, a while back, informed its readers that an industrial payroll of 25,000 workers for the town was in the making. The readers were quick to surmise Hughes.

IDEAL SPOT FOR H-28 HELICOPTER

Los Angeles version of the Hughes Las Vegas story, set to a more modest scale, is that he plans to move his helicopter operations to the Nevada resort—providing, of course, the production contract he now holds for the giant jet-powered H-28 flying crane is not cut back. The Hughes Aircraft Co. plant and field at Culver City have sufficed for the construction and initial testing of the experimental XH-17, but a lot more room is needed to go into production on a job like the H-28. If Hughes has anything else up his sleeve—that might lead to a payroll of 25,000 workers for Las Vegas—the news hasn't leaked out in Culver City.

The purchase negotiations with Lockheed Aircraft Corp. will have no bearing on the future of the big helicopter, or the removal of this phase of Hughes operations to Nevada. Like the great eight-engine flying boat straining at its RFC hawsers on Terminal Island, Long Beach Harbor, the helicopter stays with Hughes. Both of these large-size items are excluded from the deal; a sound arrangement it would seem, in that the big boat and the big helicopter are just the sort of projects to appeal to the imagination of Howard Hughes, but not exactly to that of Robert S. Gross.

HUGHES RELEASES TRANSPORT PLANES

A couple of other items will cause no complications in a transfer of assets. These are the so-called "mystery" planes that caused so much speculation last winter, one a Douglas DC-6, the other a Model 749 Constellation. By stipulation of Hughes, neither of these planes underwent the customary production flight test prior to delivery. Delivery in both cases was no more than a towing job across the field. The Constellation, protected by armed guards who let no one near, remained parked in the same spot at Lockheed Air Terminal for more than a year. Similarly, guards kept the curious away from the tent Hughes pitched for the DC-6 at the Santa Monica Municipal Airport where he was reported preparing to have it equipped as an electronic plane.

The Constellation finally has sprouted its wings, transferred back from the Hughes Tool Co. to TWA, for whom it originally was ordered, and having been overhauled and put in flying condition at Lockheed Aircraft Service. The DC-6 is on its way to Italy, sold to LAI, which is happy over the opportunity to have been able to take delivery of the craft in time for the heavy travel season. This re-sale, incidentally, is said to have netted Business Man Hughes a profit of around $200,000, or enough to have made his investment in the DC-6 pay off quite handsomely irrespective of his original intentions.

Whereabouts of still another plane came to light the other day. It is a Martin 2-0-2, which is stored in a hangar rented by Hughes at the Bisbee-Douglas International Airport down by the Mexican border in Arizona. It has been there for several months now. Why it is there or how much longer it may stay there remains unrevealed. No one at the airport even admits to knowing anything about it.

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All-cargo Super Constellations will soon serve Seaboard & Western and other leading operators.

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LOCKHEED'S

NEW SUPER HAULS FREIGHT FASTER, CHEAPER

On the opposite page you see illustrated the rear loading area of a big Super Constellation 1049-D, designed to carry more freight farther, faster and cheaper than ever before in history—closely approaching the sought-after 5¢ per ton-mile operating cost.

This all-cargo version of the Super Constellation culminates 7 years of special cargo research by Lockheed and is so different from the passenger versions that the fuselage requires separate production jigs.

The 1049-D utilizes the most economical form of power available to aircraft, the turbo-compound engine. Four of these Wright engines, each rated 3250 horsepower for take-off, give the Super Constellation a 332-mph cruising speed at 20,000 feet. It will fly the 3,459 miles from New York to London non-stop in 13½ hours with a payload of 14 tons, crew of 5 and full over-water equipment—will fly 24,500 lbs. non-stop to Berlin.

DESIGNED TO CUT COSTS

The Super Constellation was designed for "loadability," so as to assure maximum efficiency and cut costs in man-hours.

Total usable payload volume is 5568 cu. ft., equivalent to a storeroom 46.4 ft. by 15 ft. and 8 ft. high. Total floor area for cargo is 1032 sq. ft.

The integrated all-magnesium floor is the finest being installed in any air transport today, according to both commercial and military operators who have inspected it. Concentrated loads from skids and legs may exert up to 400 lbs. per square inch. Floor loads of 1000 lbs. per lineal foot or 300 lbs. per square foot may be applied in the main cabin.

SPECIAL TIE-DOWNS AND BUILT-IN CONVEYOR

Floor tie-down fittings in a grid pattern of approximately 20" x 20" provide for loads of 4,000 lbs. in any direction. Wall tie-downs will take up to 4,500 lbs. each.

At a push of a button the built-in conveyor will pull (or *push*) loads over 12,000 lbs. on rollers or dollies or will skid a load of 8,000 lbs., reducing man power to a minimum.

The all-cargo Super Constellation is completely heated, pressurized and refrigerated. Normal equipment includes dual heaters, superchargers and refrigeration units. This gives cargo operators complete freedom in operational planning and insures protection of the cargo, regardless of its type or the nature of the operation.

Extra Section

By William D. Perreault

CASEY JONES' Academy of Aeronautics at La Guardia Field, N. Y., has managed to reverse the trend in enrollments at mechanic schools which has been experienced on such a wide and continually worsening scale throughout the country. Comments Jones: "I might say in our own case, since we quit wasting our time looking for government contracts and have gone back to hard work and real selling, we have been doing much better, and as a consequence we started our biggest spring class in March, all statistics to the contrary."

•

While on the subject of statistics we have some interesting ones out of the documents in the Pioneer Mail Rate case, showing the manner in which engine overhaul costs are going up. Cost of overhauling a Pratt & Whitney R-1830 engine, such as is used in many DC-3's, has jumped from an average of $2,033 a year ago to $2,943.69 this year, a letter from James H. Squires at Dallas Airmotive, Inc., states. This latter figure is based on a 13-engine sample and neither figure includes approximately $65 in fuel costs. Labor costs accounted for about $500 of the increase and increased parts costs for the remainder.

•

It was at **Bill Long's** Dallas Airmotive that a Douglas DC-3 with only eight hours total flight time made an appearance recently, according to **Mark Miller,** Convair's assistant to the vice president of sales. Mark tells us the plane was one of the DC-3's which were still at the factory when the war ended and which Douglas fitted out as commercial jobs. Superior Oil Company bought one of these, put on its own markings, and got a couple of hours of flight on the plane before deciding to put it in storage for a while. Now it's going back in service, a really new DC-3.

•

We recently gave credit to Southwest Airways for being the first airline to install red lights over the emergency exits (in its Martin 2-0-2's). While our traveling editor and publisher, Wayne W. Parrish, was flying Southwest's routes last week SWA president John Connelly took the opportunity to disclaim this "first." He reports that Chicago & Southern started using this set-up some time ago in its DC-3's. SWA's arrangement lights the emergency exit lights when the "Fasten Seat Belt" and "No-Smoking" signs are on.

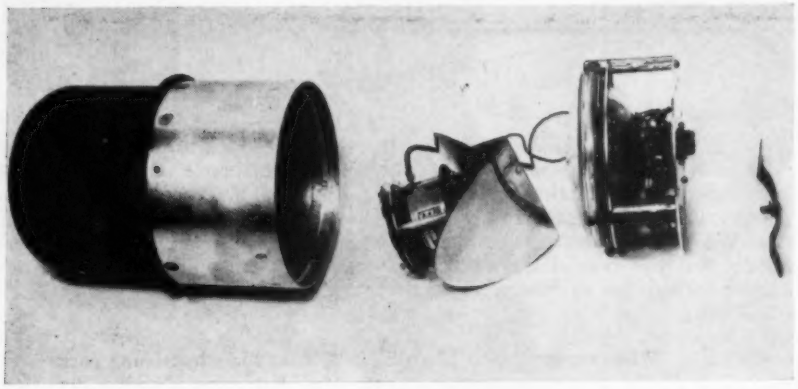
•

The Fido (fog, instantaneous dispersal of) system at Eureka, Calif., which had such a hopeful career nipped in the bud by installation blunders, has now been largely torn up. It proved completely ineffective as installed. All of the high-intensity approach lights and other equipment, except for the slope-line system, which once marked Eureka as the country's all-weather flying experiment station have now been removed. The airlines are still "bellyaching" over the fate of Fido.

•

Capital Transit Company, which operates the street cars and buses around the nation's capital, and which gets higher passenger fares in its run-down buses than the airlines do in their plush postwar liners, gives us this picture of the sad plight of this type of public carrier: the average bus or street car (despite load factors which in my humble estimation run at about 175%) takes in about $56 per day, sometimes operating as much as 20 hours a day. Direct maintenance and operation costs plus overhead takes $32 of this. Depreciation and related items takes another $17 per day per vehicle and taxes take five dollars. Capital Transit's net: two dollars per unit per day. Ah, to operate an airline!

Maintenance Bulletin Board



ANTI-COLLISION BEACON designed by United Air Lines and recently adopted by Los Angeles Airways for helicopters uses a motor driven reflector (center) to produce a high intensity flashing red signal. Other known airline users include American Airlines and New York Airways, while over 200 units have been sold for corporation aircraft.

UAL Beacon Adopted by Helicopter Fleet

Los Angeles Airways has adopted the United Air Lines-developed rotating beacon light for its entire helicopter fleet, adding to a growing list of airline, corporation aircraft, and other transports seeking improved flight recognition through better exterior lighting. A product of the efforts of UAL engineers Evan Jensen and Jim Aldrich, the light "makes the best possible collision insurance" according to Fred Milam, operations director of LAA.

The UAL beacon is made up of a specially developed General Electric 50,000-candlepower, sealed beam lamp mounted below a motor-driven, two-bladed reflector, all covered by a red glass dome. Operating at 40 revolutions per minute, the reflector gives a beam 20° above and below horizon. Its 40-rpm rotation provides 80 flashes per minute within a 10° angle of horizon and 40 flashes per minute throughout the remaining 30° of the beam.

Total installation weight of the equipment is about five pounds. The complete assembly is manufactured by the Grimes Manufacturing Company of Urbana, Ohio, under the licensing arrangement and lists for approximately $70, complete with mounting brackets.

Grimes has under design the required mounting equipment for installation of beacons atop the vertical stabilizer of Douglas DC-3, DC-4, and DC-6, Convair 240 and 340, and Boeing 377 airplanes. Other designs for fuselage-top installation are being completed for the Beech D18 and Bonanza, and the Lockheed Lodestar.

Filler Necks Refaced in 3% of Time

Mohawk Airlines welder M. E. Anthonson has developed a tool which refaces the fuel tank filler necks of the airline's Douglas DC-3's in less than one hour, a task which formerly consumed some 33 hours from start to finish.

The Anthonson idea involves a milling refacer, which eliminates the need for removal of the tank from the airplane, and which can be made with about 16 hours of labor and four dollars worth of material.

The problem of filler neck scuffing by fueling nozzles resulted in poor tank cap sealing, and the danger of water seepage into the tanks whenever the airplane was washed. Labor to remove the tank and to replace the filler neck ran high, 25 man-hours for the tank replacement and eight for that of the filler neck.

The new tool which refaces the filler neck with the tank in place consists of five basic units: a milling bit and drive shaft; an air driven motor to drive the miller; a threaded center shaft; a securing plate; and a gage with three leveling points. The assembly has two resting points, the securing plate fixed on the filler neck by four aligning bolts and the milling bit on the surface of the filler neck.

The bit is turned at a speed of 1500 rpm by the air-driven motor, used to avoid ignition of fumes from the gas tank. Two oil-covered plates on the center shaft catch all metal particles resulting from the operation and protect the tank from contamination. The oil and metal are then removed by a vacuum machine.

Heavy duty towing operations in Pan American World Airways Pacific-Alaska Division call for Caterpillar D V10 tractor, shown moving Boeing 377 Stratocruiser. Tractor has special counterweights under the machine to increase traction and satisfy the 14,000-pound drawbar pull loads faced under average conditions at the PAA base. Pintle hooks at front and rear of unit permit either pushing or towing.

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REFRIGERATION
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Whether it be the pressurizing and air conditioning of a modern transport, cooling the cockpit of a sonic fighter or operating indispensable accessories in a jet bomber, Stratos precision-engineered equipment meets the requirement. Stratos pressurization and cabin air conditioning systems are used by leading domestic and international airlines. Stratos air-cycle refrigeration units cool the fastest Air Force and Navy jet fighters and bombers. Light-weight Stratos air-turbine drives provide dependable power for accessories in jet night fighters and bombers.

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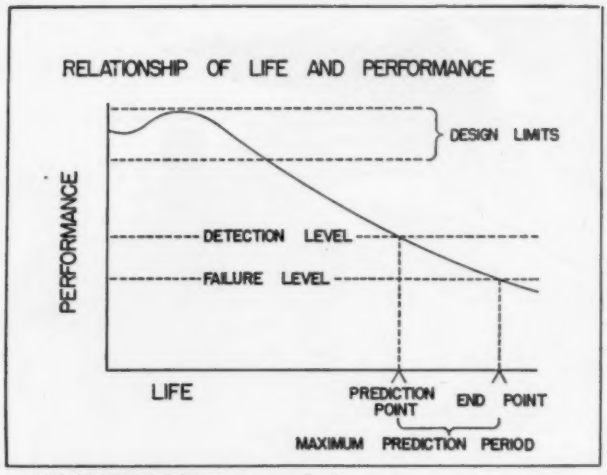
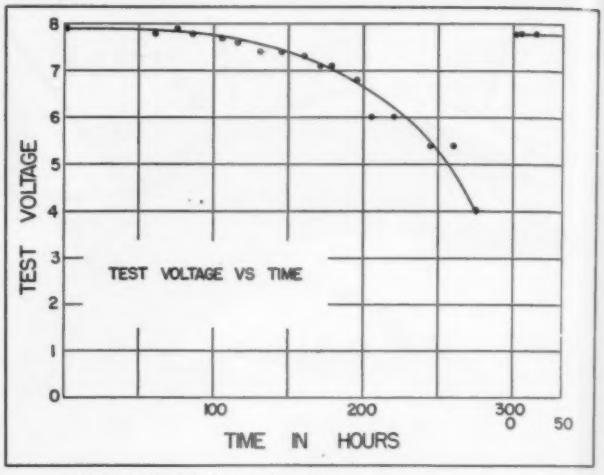


MOST TUBE failures are gradual . . .



. . . AND TREND is predictable.

New Device Predicts Vacuum Tube Failures

Simple instrument developed for Navy is expected to quadruple hours of operation between failures.

By Joseph S. Murphy

THE National Bureau of Standards, working under the sponsorship of the U. S. Navy's Office of Naval Research, has come up with a new slant on the improvement of electronic equipment reliability.

In a back-door approach to greater reliability which assumes that the age-old weak spot in electronics performance, the vacuum tube failure, will be around for some time to come, NBS has developed a device for predicting these tube failures long before they actually happen. A final report to the Navy, now being prepared, will highlight these findings:

• **Some 73% of all vacuum tube failures** in electronic equipment can be predicted. Of seventy-nine which failed during an accelerated 1000-hour test using a standard military communications receiver, 82% were gradual in nature and predictable—and of these, the NBS test unit was successful in forecasting 89% long before the equipment performance was affected.

• **At this rate,** on a modern military bomber, which carries in the neighborhood of 2500 vacuum tubes and has a tube failure every 10 hours of operation, prediction equipment would drop the exposure factor to a failure every 43 hours of operation.

• **Failures of components** other than vacuum tubes were negligible. Their scope would not warrant further attention as to their predictability.

The one big aim of the Bureau of Standards test program, aside from that of finding a means of predicting the failures, was that of simplicity—to provide a way whereby unskilled maintenance personnel could make the checks quickly and easily, with a test device that would lend itself to routine usage. The result produced at NBS is such a device. A mechanic can simply plug it into the electronic unit to be checked, turn a selector switch, and get a red-light warning that pinpoints the stage or component which has fallen below safe performance levels and has become a potential source of total unit failure.

Audio Signal

The detector used by the Bureau was made up of a 3000-cycle oscillator, a voltage-sensing circuit, a leakage-detection circuit, and an alarm light. By modifying the unit under test, in this instance an 18-stage, guard channel, military communications receiver, provision was made for breaking grid and plate return leads to permit insertion of an audio signal and a means for measuring voltage gain. Connections were made to a centralized plug, to which the test unit could be connected.

The actual method of detecting the drop-off in performance finally arrived at in NBS was one of sensing the decrease in tube transconductance (voltage gain) of critical stages. By operating the vacuum tube as a resistance-coupled amplifier and applying a 3000-cycle signal, the drop in voltage gain was automatically sensed in relation to a predetermined safe level. Whenever the accepted level was exceeded, the sensing circuit which was wired to trigger off the alarm light would indicate an impending tube failure.

This same prediction accuracy cannot be obtained in multi-stage equipment merely by measuring input and output performance, NBS found. Here the tolerance of an overall measurement will usually conceal the drop in performance of one stage that may precede a failure in that stage.

Tests showed that daily variations alone in the measured gain of a typical piece of equipment are greater than that caused by the gradual deterioration of one tube in one stage; as the tube continues to lose efficiency, the point when this condition becomes noticeable may practically coincide with that of the complete failure of the unit.

NBS used six military receivers of a classified type for the program. To accelerate failures, component temperature were cycled between 10° C. and 120° C. at 15-minute intervals, voltages were maintained constant at 15% above design values, and plate voltages were occasionally raised to 150% of normal for one-second periods.

The test project in itself appears to have been a big success, but whether the results will be put to practical use remains to be seen. To the Bureau of Standards these results point in one direction—the use of simple prediction units in important electronic systems where a failure can produce a major hazard should be given very serious consideration. • • •

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This is it . . . a screwdriver . . . the only tool needed for quick field replacement of Philco microwave units. Philco microwave is the answer to the need for swift, reliable communications. Philco design emphasizes minimum field maintenance time and cost. All major components are "packaged units", quickly and easily replaced on the site with only a screwdriver, permitting convenient depot checkout, for fullest use of field time.

Using JAN (Joint Army-Navy) specification components wherever applicable, Philco microwave is the only equipment available for commercial use with such high standards of quality. Philco microwave gives propagation and equipment reliability unmatched in the field . . . you should investigate.

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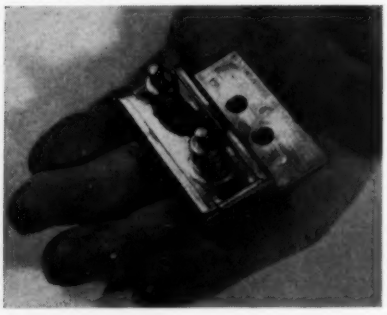
New Products

Wheel Block

A heavy-duty aircraft wheel block which is designed to hold the heaviest aircraft has been placed on the market by the Calumet Steel Casting Corp. Called the Casteel Safety Wheel Block, the new chocking device features heavy steel gripper teeth on the bottom plate to prevent slippage, even when used on ice or snow. Owner's name may be cast on the bottom plate to protect against pilferage.

Address: **Calumet Steel Castings Corp.**, 1636 Summer Street, Hammond, Ind.

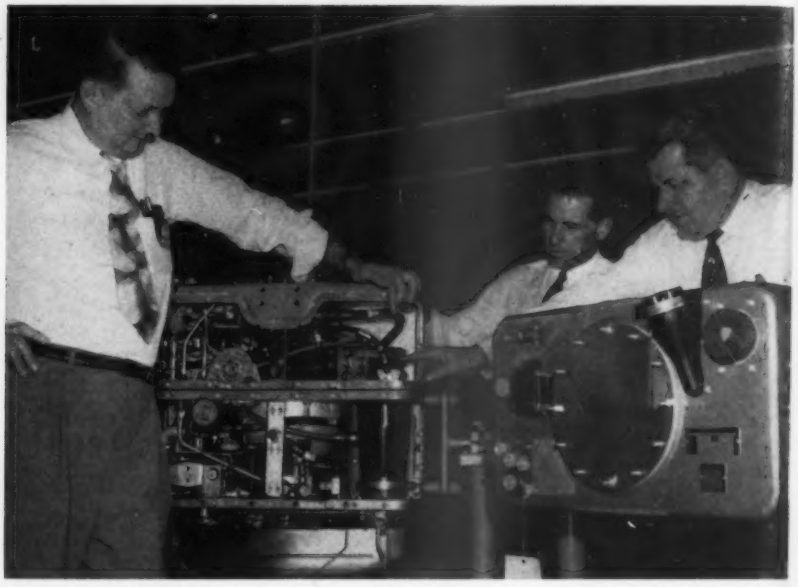


Spot Heater

Westinghouse Electric Corporation has announced the availability of a small spot heater which weighs only eight ounces and which will assure proper functioning of aircraft instruments when exposed to sub-zero temperatures.

A resistance element type heater, the new Westinghouse product operates from a 28-volt, d-c power supply and is rated at 100 watts. Electrical connectors consist of double-nut terminals with the negative terminal grounded to the case. Overall dimensions permit heating of flat surfaces as small as 1" x 1⅜".

Address: **Westinghouse Electric Corporation**, Box 2099, Pittsburgh 30, Pa.



FIRST PRODUCTION gas turbine at AiResearch-Phoenix undergoes final inspection. Employes shown (l. to r.) are F. Richards, turbine assembly foreman; J. Lewis, shop superintendent; and M. Gelber, vice-president and plant manager.

Ram Air Turbine

A ram air turbine which will provide an emergency power source to operate power controls on single-engine jet planes in case of engine failure has been developed by AiResearch Manufacturing Co.

Scheduled for installation in McDonnell's F3H, the new turbine develops a minimum of 3.4 hp at speeds from 130 knots to above Mach 1 at any altitude, and supplies enough power to operate a 3000 psi hydraulic system.

The AiResearch unit occupies less than ¾ cubic feet of space and weighs only 17 pounds. By eliminating storage batteries and electric motors, it is said to save approximately 200 pounds.

Address: **AiResearch Mfg. Co. of Arizona**, 402 South 36 St., Phoenix, Ariz.

Quadrant Lock

An irreversible quadrant lock for aircraft controls, which weighs less than one pound, has been designed by the Reid Metal Parts Co. of Burbank, Calif. The lock has successfully passed tests conducted at the Air Material Center, U. S. Navy, Philadelphia, Pa., and specifications are now being submitted to the Navy Bureau of Aeronautics.

The Reid device has many uses, including throttle, rpm, mixture, air scoop and oil cooler controls, landing gear doors, shell ejection doors, inspection doors, astrodome covers, and gun hoods. It may be made as a manually operated lock or as a bellcrank for installation in a control system where irreversibility is required.

The basic quadrant is constructed of stainless steel parts and may be altered to meet any installation or stress requirement. The production model is designed for loads up to 150 in.-lbs., with a safety factor of five to one. The mounting frame may be adapted to fit any requirements for single- or multiple-control systems.

The new lock consists of a pivotable lever which has a locking mechanism of three working parts, two locking shoes, and a quadrant—to lock a secondary or output lever. The secondary lever is always in a locked position with no backlash or lost motion. Any additional force on the secondary lever, in either direction, compounds the coupling or sheer action between the shoes and the quadrant.

The lock is unaffected by vibration regardless of load and does not depend on friction. When the primary lever is moved in either direction, the shoes on the quadrant unlock; when the force is released the mechanism automatically returns to the locked position.

Said to be the only lock which has successfully met the Navy test requirements, the Reid development is a free operating assembly, requiring no lubrication or adjustment. Extremely fine settings can be made and held under heavy vibration.

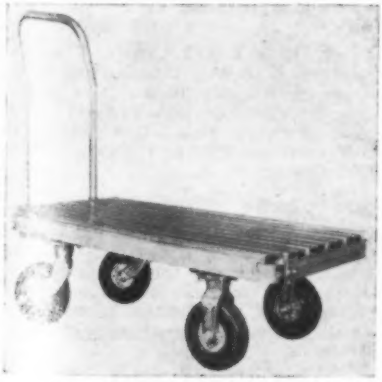
Address: **Reid Metal Parts Co.**, 2021 No. Lincoln St., Burbank, Calif.

High-Intensity Light

Thermal Beam, a new automatically controlled, high-intensity airport runway light announced by the Line Material Company, gives promise of solving many of the operating problems in high-intensity lighting. Approved under CAA Specification L-818, the new lighting unit combines operation, brightness, and coning controls into a single operation, and by elimination of beam control circuits and auxiliary equipment offers lower installation and maintenance cost.

The Thermal Beam operates on the principle that increased intensity should be accompanied by a corresponding increase in coning to provide the ultimate in visibility, and this coordinated feature is built into the new light. In optical design, the Thermal Beam uses fewer light control elements, thereby increasing its maximum optical efficiency.

Address: **Line Material Company,** Airport Lighting Division. Milwaukee 1, Wis.

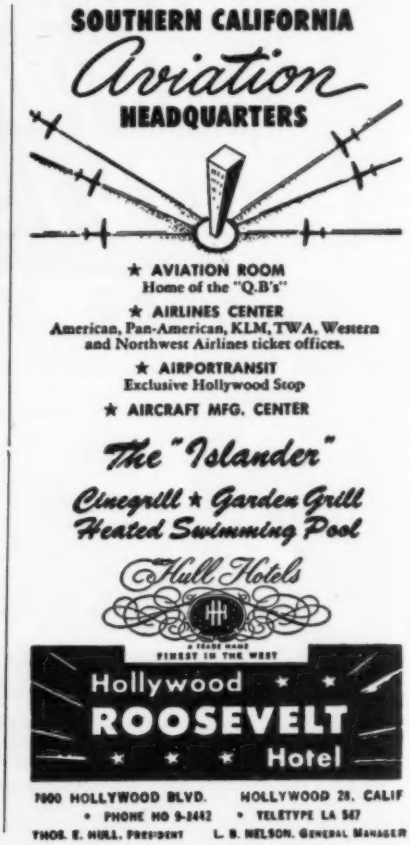


R nded Corner

obey Manufacturing Corp. of El Se- Calif., has announced a new de- ature for its all-aluminum materials ha ng trucks—a cast aluminum rounded co for the truck bed frame, intended to minate the source of damage and ha presented by the sharp corner de- previously used.

The Tobey Tonster, shown here, is 2 ide and 48" long, weighs 57 pounds an capable of carrying a one-ton load.

ddress: **Tobey Manufacturing Corp.,** 12 El Segundo Blvd., El Segundo, Calif.



Technical Literature

RUBBERIZED ABRASIVES: Application of Cratex rubberized abrasives, together with complete specifications and prices, appears in Catalog No. 53 issued by the Cratex Manufacturing Co., 81 Natoma St., San Francisco 5, Calif.

•

ROTARY TOOLS: M. A. Ford Manufacturing Company, Inc., Davenport, Iowa, has published a new catalog which includes descriptions, illustrations and specifications and 363 shapes and sizes of high speed steel rotary tools.

•

SILICONE RUBBER INSULATION: "Silicone Rubber: A New Insulating Material for Wire and Cable" is a reprint of a recent trade article written by M. G. Noble, silicone engineer, General Electric Company, Pittsfield, Mass.

•

AIR DIFFUSERS: New 64-page selection manual No. 45-1953, published by Anemostat Corporation of America, 10 East 39th Street, New York, N. Y., contains data for simplifying choice of proper air diffusers in air conditioning systems.

•

MOLDED AND EXTRUDED RUBBER PARTS: Various types of molded and extruded rubber parts manufactured by the Industrial Division of Tyer Rubber Company, Andover, Mass. are detailed in a new catalog titled "Molded and Extruded Parts of Natural and Synthetic Rubber."

•

FORK LIFT TRUCK LIGHTS: Catalog sheet outlines selection of lighting combinations for all fork lift trucks and tractors manufactured by Towmotor Corporation, 1226 East 152nd Street, Cleveland 10, Ohio.

•

TIME DELAY RELAYS: G-V miniature and octal size thermal time delay relays of hermetically sealed adjustable type are described in a four-page, two-color brochure, Publication No. 30, by G-V Controls, Inc., 28 Hollywood Plaza, East Orange, N. J.

•

FASTENERS: Franklin C. Wolfe Company, Inc., 3644 Eastham Drive, Culver City, Calif. is distributing a new brochure describing their standard products and services for sealing bolts, studs, rivets, AN fittings, access doors, hatch covers, flanges, and electrical terminals.

•

DEWPOINT MEASURING: A new eight-page, two-color bulletin on dewpoint measuring equipment for indication and recording of dewpoint temperature in a gas stream is available from the General Electric Company, Schenectady 5, N. Y.

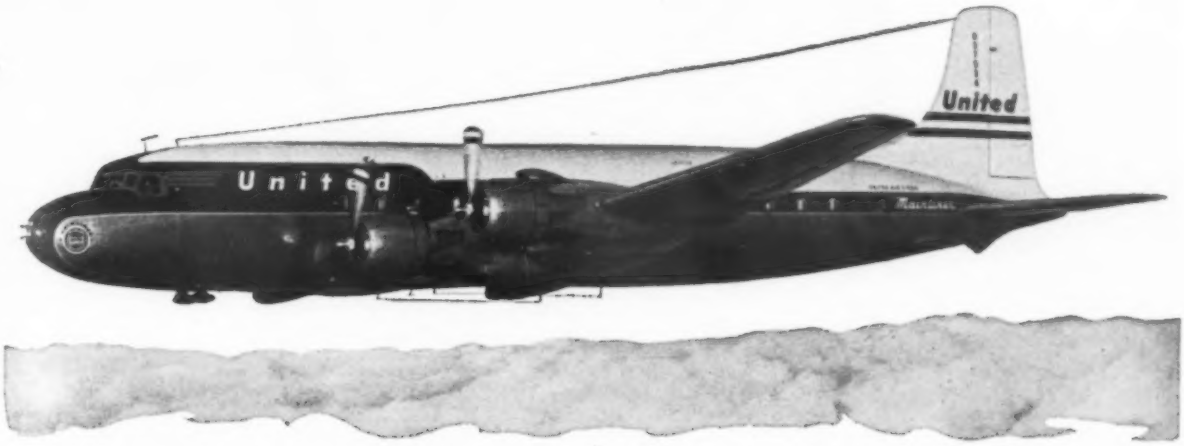
•

METALWORKING. An addendum to the 1950 "Directory of Metalworking Machinery" has been issued by the Defense Supply Management Agency of the Department of Defense. Copies are available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

UNITED
AIR LINES

DEPENDS ON CHAMPIONS

146 miles a minute—every minute of the year!



Every minute of the day and night, United Air Lines Mainliners cover 146 miles—a total last year of 77,000,000 miles—and depend on Champion Spark Plugs every mile of the way!

Now in its twenty-sixth year of operation, United is the oldest transcontinental airline, flying three million passengers a year on routes stretching from Boston to Honolulu and from Vancouver to San Diego.

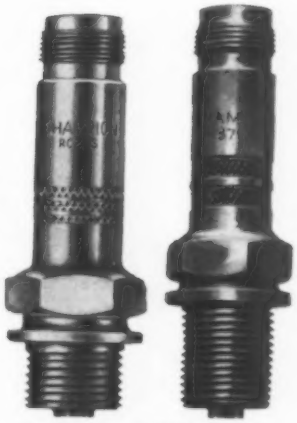
United is an exclusive Champion user, as are the great majority of major air lines in this country and abroad.

Says Mr. J. A. Herlihy, United vice president in charge of engineering and maintenance: "Champion Spark Plugs play an important part in helping us maintain our reputation for safety and dependable operation. If better spark plugs than Champion were available we certainly would be using them."

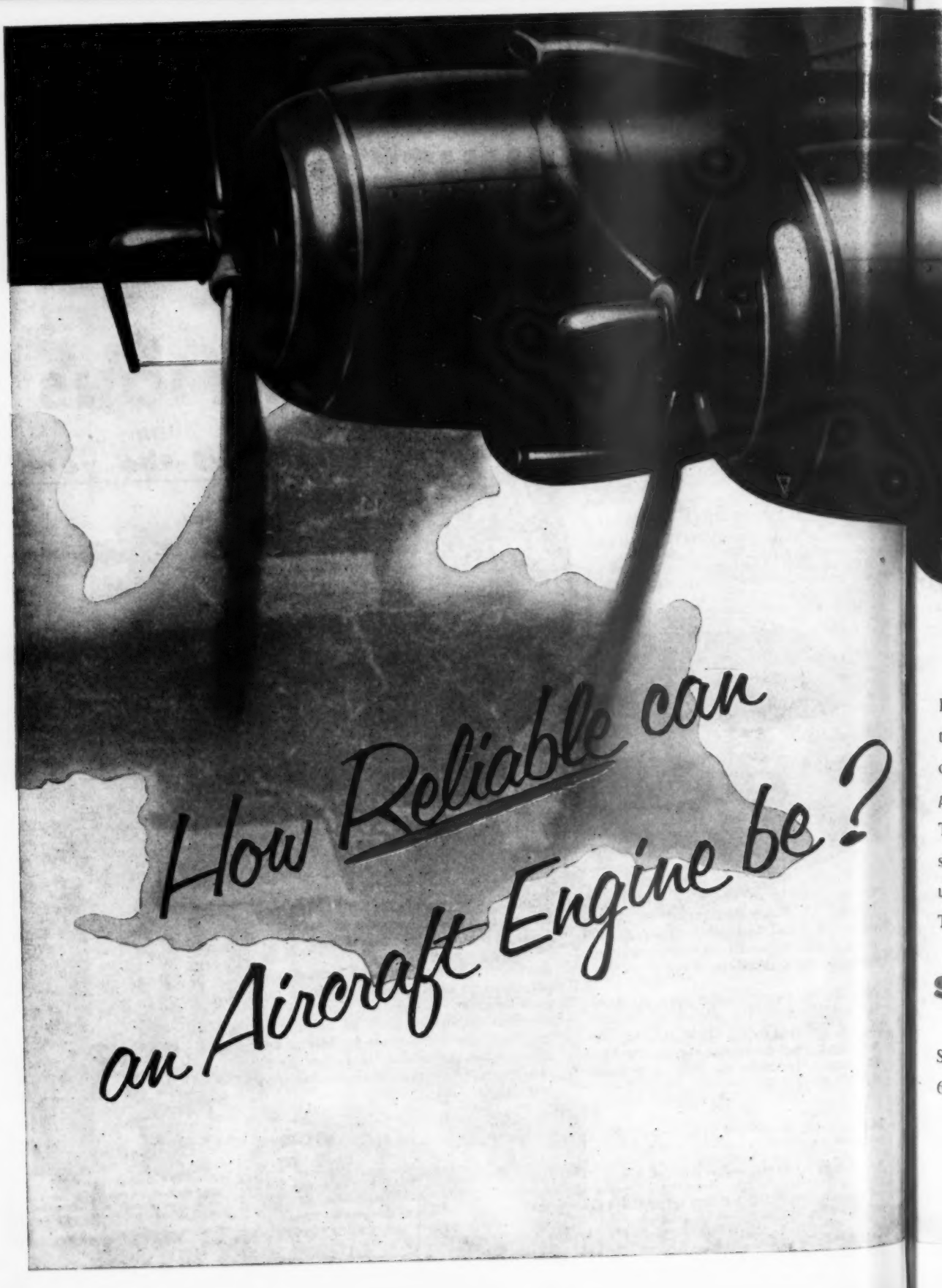
CHAMPION SPARK PLUG COMPANY

TOLEDO 1, OHIO

CHAMPION
IS A PRIME SUPPLIER OF AIRCRAFT, MARINE AND AUTOMOTIVE SPARK PLUGS TO THE U. S. ARMED FORCES
★



The RC26S and R37S-1 are the most widely used of Champion's many types of aircraft spark plugs.


How Reliable can
an Aircraft Engine be?

From the moment an airliner's propellers bite the air —
to the time hours later when their thundering engines are cut,
oil fights a constant battle against damaging heat and friction. *An engine's performance is only as reliable as the oil that lubricates it.*
To maintain their reputation for dependability, the top airlines in the nation specify the very best in Aircraft Oils. *Today, more than 45% of the oil* used by major scheduled airlines in the U.S. is supplied by Sinclair.
There is no better proof of dependability.

SINCLAIR AIRCRAFT OILS

Sinclair Refining Company, Aviation Sales
600 Fifth Avenue, New York 20, N.Y.

Emigrant Fares 30% Lower Across Pacific

Canadian Pacific Airlines is charging emigrant fares from Hong Kong and Tokyo to Vancouver that are 30% under the regular tariffs of other carriers.

The same fares, specifically limited to emigrants, were requested several months ago by all Pacific carriers through the International Air Transport Association, but were disapproved by the Civil Aeronautics Board as "adverse to the public interest . . . unjustly discriminatory . . . uneconomic fare reductions."

Following disapproval, CPAL filed the same tariffs with Canada's Air Transport Board, which allowed them to become effective April 8. Hong Kong-Vancouver rate is $500, compared with regular fare of $726, while Tokyo-Vancouver is $450 against $650. The $726 and $650 fares are also charged by other lines to west coast cities, such as Seattle and San Francisco.

Whether Pan American, Northwest and Philippine Air Lines will meet CPAL's fares remains to be seen. Some officials have claimed there is substantial emigrant traffic, others hold that it is sparse. If the U.S. lines file such tariffs, CAB cannot suspend them, although it may start an investigation.

SIMMONDS
ENGINEERING BRIEFS

High Strength Access Latch weighing only 3.2 ounces, takes an ultimate load of 2,700 lbs. in tension, 5,000 in shear. Designed for panels, cargo doors, radomes, and similar surfaces. Suitable for either hinged or detachable panels. Special pull-up and adjustment features. Heavy duty toggle gives positive lock when flush.

Simmonds Cowling Latches weigh 6 to 8 ounces, take an ultimate load of 7,000 lbs. Pull-up is ¾ inch. Sizes to fit cowling curvatures from 27 inches to flat. For bulletins on these latches, write to:

SIMMONDS AEROCESSORIES, INC.
TARRYTOWN, NEW YORK

Branch Offices: Glendale, Calif. • Washington, D.C. • Dallas, Tex. • Dayton, Ohio • Canadian Co., Montreal

Airline Commentary

By Eric Bramley

WHAT do present and potential air travelers want to know about the airlines? Do they want to read advertisements about speed and safety, or price and accommodations? It seems that the airlines have been stressing the latter, while a survey shows that people are much more interested in the former.

Interviews with 670 people were conducted by the school of business administration of the University of California at Los Angeles. Over 80% of those interviewed had seen or heard air travel advertising recently; 48% recalled one or more of the ideas in the ads. The idea remembered by most (20%) was price, but only four per cent said that price had anything to do with whether or not they liked a particular form of transport. Only 11% recalled anything about speed in ads, but 90% of air travelers and 66% of potential passengers said that this was a definite advantage.

On the all-important subject of safety, 53% of the people who haven't traveled by air said fear of accidents was the thing they disliked most about air transport, and 23% of the air travelers had the same feeling. Yet only two per cent remembered seeing anything about safety in airline ads.

It may be that the airlines won't agree with all the survey results (many will claim that they have stressed speed, for example), but at least they may want to take another look at what they're trying to sell.

•

In the March 30 issue, we discussed the Brian Donlevy television show, "Dangerous Assignment," and noted that wherever Donlevy traveled he was always on a TWA Connie. However, interior shots showed him sitting in a single seat next to a square window and we suggested that maybe TWA should have him filmed in a double seat next to a round window. This item has drawn comments (including one from Ralph Damon, president) from throughout the TWA system. Biggest point made is that Super Connies have square windows, so Donlevy's okay. We invite all those who commented to watch the show. If we recall correctly, the interior furnishings are shades of the 30's. You fellows really wouldn't want them in your Super Connies.

•

Many times in this column we have given credit for excellent airline promotional material. Now we want to give you one man's opinion on how *not* to promote air transportation.

We have a brochure distributed by TPA Aloha Airline (owned and operated by Trans-Pacific Airlines Ltd., in Hawaii). TPA is operating DC-3's, and for the most part the brochure does a creditable selling job. However, on facing pages there is reproduced (1) the award received by TPA from the National Safety Council for fatality-free operation, and (2) results of a survey on which twin-engine airplane people prefer. This survey, conducted in the U.S. by a research organization, purports to show that a substantial majority of air travelers prefer the DC-3 for "safety and dependability" over two other types of twin-engine transports (which are named in the brochure). In addition to air travelers, the general public was questioned and was said to show a similar preference for the DC-3 for "safety" and "reliability."

TPA faces Convair competition from Hawaiian Airlines. But since when is it good practice to print graphs, each representing—by name—an airplane and allegedly showing how yours is preferred over all others for safety, reliability and dependability? There's certainly nothing wrong with talking about the general subject of safety, but since when is *comparative* safety being used in promotional literature? It's the first time we've ever seen this approach used. We trust it's the last.

Domestic Airline Revenues and Expenses, Fourth Quarter 1952

Airlines	Total Operating Revenues	Passenger Revenues	Mail Revenues	Express Revenues	Freight Revenues	Excess Baggage Revenues	Non-Scheduled Transport Rev.	Total Operating Expenses	Aircraft Operating Expenses	Ground & Indirect Expenses	Net Operating Income Before Income Taxes
American	$ 48,127,401	$ 40,263,168	$ 2,249,111	$ 1,271,102	$ 2,839,026	$ 430,069	$ 243,717	$ 41,833,140	$ 20,756,786	$ 21,076,354	$ 6,294,261
Braniff	7,221,364	6,599,460	112,732	148,323	183,241	50,882	105,598	7,296,226	3,578,470	3,717,756	-74,862
Capital	10,911,171	9,414,669	280,817	334,338	296,399	65,130	402,578	9,971,130	4,750,340	5,220,790	940,041
Caribair	275,432	209,454	45,211	. . . .	8,045	1,642	2,992	273,606	117,776	155,830	1,826
C & S	3,882,108	3,378,472	215,546	114,204	99,488	27,460	36,569	3,285,904	1,585,465	1,700,439	596,204
Colonial	1,640,132	1,215,030	325,526	12,859	21,637	7,506	52,174	1,474,672	648,285	826,387	165,460
Continental	2,633,478	2,236,250	285,483	22,932	56,710	14,399	165	2,418,987	1,251,355	1,167,632	214,491
Delta	7,071,991	6,232,264	286,002	141,336	240,558	75,774	72,383	6,137,459	3,090,500	3,046,959	934,532
Eastern	29,149,778	26,999,172	626,483	532,503	383,543	415,389	84,521	23,374,856	12,242,861	11,131,995	5,774,922
Hawaiian	1,085,650	695,113	199,057	. . . .	168,569	13,135	2,821	1,070,484	409,802	660,682	15,166
National	6,989,331	6,024,794	199,420	65,478	347,166	145,110	59,353	6,341,529	3,182,195	3,159,334	647,802
Northeast	1,570,730	1,202,024	283,788	29,499	24,427	5,082	1,922	1,727,216	739,382	987,834	-156,486
Northwest	9,342,880	7,811,319	542,767	215,892	447,151	49,426	200,161	10,411,448	4,774,151	5,637,297	-1,068,568
Trans Pacific	417,625	296,155	78,480	1,619	13,398	2,431	16,015	437,379	164,513	272,866	-19,754
TWA	31,298,467	27,194,538	1,392,047	980,614	1,002,527	222,725	123,665	27,156,918	14,482,261	12,674,657	4,141,549
United	37,192,178	30,788,021	2,617,416	1,250,941	1,488,301	240,364	266,272	32,173,496	15,061,193	17,112,303	5,018,682
Western	4,768,604	4,144,398	210,585	81,058	74,494	24,817	742	4,077,365	1,928,647	2,148,718	691,239
TOTALS	203,578,320	174,684,301	9,950,471	5,202,698	7,694,680	1,791,341	1,671,648	179,461,815	88,763,982	90,697,833	24,116,505

All-Cargo Airline Operations, Fourth Quarter and Calendar, 1952

Airlines	Freight Ton-Miles	Available Ton-Miles Flown	% Available Ton-Miles Used	Revenue Plane-Miles Scheduled	Scheduled Miles	% Scheduled Miles Completed	Total Operating Revenues	Freight Revenues	Non-Scheduled Transport Rev.	Total Operating Expenses	Aircraft Operating Expenses	Ground & Indirect Expenses	Net Operating Income
October, 1952													
Fly. Tiger	3,833,697	4,713,954	80.81	729,839	623,868	98.14							
Riddle	1,028,540	1,278,789	80.43	232,856	145,514	100.00							
Slick	5,033,618	6,114,070	82.33	917,942	846,015	87.62							
US Airlines	Final figures are not available.												
TOTALS	9,895,855	12,136,813	81.60	1,880,637	1,615,397	92.80							
November, 1952													
Fly. Tiger	3,444,031	5,037,251	68.37	766,112	552,102	99.66							
Riddle	1,131,567	1,291,676	87.61	229,841	140,820	100.00							
Slick	4,909,813	5,614,483	87.45	847,868	811,060	78.26							
US Airlines	Final figures are not available.												
TOTALS	9,485,411	11,943,410	79.42	1,843,821	1,503,982	88.15							
December, 1952													
Fly. Tiger	3,740,885	4,479,781	83.51	689,197	620,076	99.31							
Riddle	1,086,362	1,370,424	79.27	242,462	140,820	100.00							
Slick	4,954,023	5,630,149	87.99	882,676	843,486	64.69							
US Airlines	Final figures are not available.												
TOTALS	9,781,270	11,480,354	85.20	1,814,335	1,604,382	81.17							
Quarter Ending December 31, 1952													
Fly. Tiger	11,018,613	14,260,986	77.26	2,185,148	1,796,046	99.01	$ 2,487,986	$ 2,236,277	$ 40,552	$ 2,160,244	$ 1,507,583	$ 652,663	$ 327,740
Riddle	3,246,469	3,940,889	82.38	705,159	427,154	100.00	528,594	496,739	. . . .	496,935	339,367	157,568	31,659
Slick	14,897,454	17,358,702	85.82	2,648,486	2,500,561	76.85	2,533,689	2,056,063	269,701	2,641,601	1,625,441	1,016,160	-107,912
US Airlines	Final figures are not available.												
TOTALS	29,162,536	35,560,577	82.01	5,538,793	4,723,761	87.37	5,550,269	4,789,079	310,253	5,298,782	3,472,391	1,826,391	251,487
Calendar, 1952													
Fly. Tiger	37,867,510	47,415,247	79.86	7,464,587	6,699,968	93.68	7,188,661	6,572,050	166,887	6,369,486	4,250,858	2,118,628	819,175
Riddle	10,778,490	13,179,870	81.78	2,357,498	1,717,004	100.00	1,732,825	1,636,983	. . . .	1,720,771	1,174,342	546,429	12,054
Slick	48,579,907	58,006,319	83.75	8,729,179	8,924,111	76.47	8,613,227	6,938,409	471,629	8,580,114	4,949,988	3,630,126	33,113
US Airlines	Final figures are not available.												
TOTALS	97,225,907	118,601,436	81.98	18,551,264	17,301,083	85.43	17,534,713	15,147,442	638,516	16,670,371	10,375,188	6,295,183	864,342

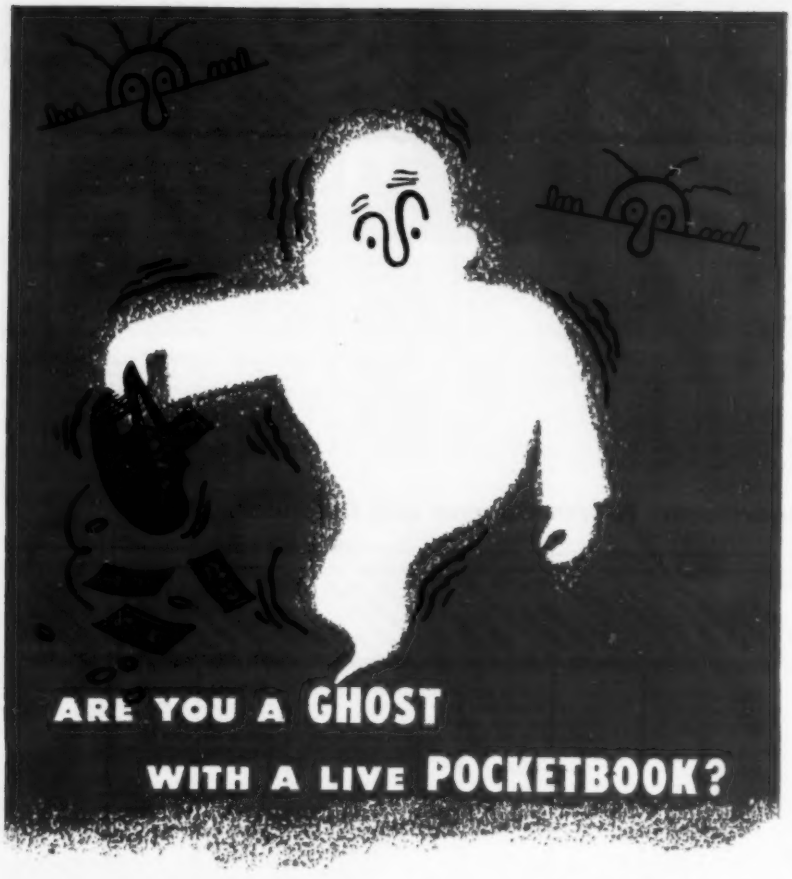
U.S. airline financial reports to the Civil Aeronautics Board are now summarized on a quarterly rather than a monthly basis. This change was made necessary by the fact that the airlines are no longer required to follow a standardized reporting system for Form 41 financial data on a monthly basis, but file monthly company management reports which vary among carriers.

The standardized Form 41 financial schedules will continue to be filed quarterly with CAB and will be summarized on that basis.

NOTE: Traffic figures are exclusive of defense contract operations. However, financial figures, i.e., total operating revenues and net operating income, reflect the net result of defense contract operations. This net figure is reported under Incidental Revenue, Account 4100, on CAB Form 41.

All-Cargo Airline Balance Sheet Data, Dec. 31, 1952

Airlines	Total Assets	Current Assets	Investments & Special Funds	Operating Prop. & Equipment	Deferred Charges	Current Liabilities	Long-Term Debt	Deferred Credits	Operating Reserves	Capital Stock	Surplus
Fly. Tiger	$ 12,337,286	$ 5,165,475	$ 2,027,599	$ 4,959,783	$ 184,429	$ 3,492,063	$ 3,246,000	$ 53,452	$ 240,208	$ 1,775,572	$ 3,529,991
Riddle	543,692	367,334	51,371	41,625	83,362	353,663	. . . .	. . . .	89,478	320,597	-220,046
Slick	7,385,601	3,504,311	934,620	2,858,925	87,745	3,398,867	197,208	72,807	50,000	4,221,520	-554,801
US Airlines	Final Figures are not available.										
TOTALS	20,266,579	9,037,120	3,013,590	7,860,333	355,536	7,244,593	3,443,208	126,259	379,686	6,317,689	2,755,144



Are you a Forgotten Customer . . . a mere name on the bills from your aviation distributor? Are your needs elbowed aside by the demands of the military, and the orders of volume purchasers? Are you accustomed to waiting?

Yes? Then *you* need Airwork. For Airwork has only *Live Customers*. The entire organization, from President to Shipping Clerks, is geared to your needs, and the best way to fill them.

You can't become a Forgotten Customer with Airwork's Personalized Service. Prompt, continuous attention to your orders prevents that.

Your engine overhauls are timed for delivery before the scheduled date. Production Control follows your order all the way. A million dollar inventory gives you off-the-shelf delivery of 12,000 different items. "Specials" that must be ordered from the factory are given a continuous follow-up so you will not face unknown delays. The next plane or truck that leaves the Airwork warehouse carries the items you ordered.

Whatever your aircraft power plant needs may be — the best way to fill them is through Airwork's Personal Service. Call Millville (N.J.) 1750; Miami 88-3467 or Washington (D.C.) Dupont 7-8864.

Airwork distributes a full line of spare parts, factory new and warranted by Pratt & Whitney Aircraft, Bendix Aviation, Continental Motors Corporation and 19 other leading manufacturers of aviation supplies.

Factory authorized distributor for Pratt & Whitney Aircraft and Continental Motors Corporation engines and engine driven accessories.

Airwork
CORPORATION
MILLVILLE, NEW JERSEY

1952 Airline Salaries

Following are 1952 airline salaries as reported to CAB:

American Airlines, Inc.

C. R. Smith, pres. and dir., $63,064 salary (up $13,582); **O. M. Mosier**, v.p. and dir., $37,145 salary (up $4,353); **R. E. S. Deichler**, v.p., $35,000 salary (up $2,208); **L. G. Fritz**, v.p., $35,000 salary (up $2,208); **William J. Hogan**, v.p. and treas. $37,145 salary (up $4,353); **William Littlewood**, v.p., $20,000 salary (down $5,833); **C. W. Jacob**, v.p., $37,145 salary (up $4,353); **R. W. D. Smith, Jr.**, v.p., $25,000 salary (up $1,104); **G. J. Brandeweide**, v.p., $29,032 salary (up $2,636); **G. K. Griffin**, v.p., $22,000 salary (up $3,379); **Carlene Roberts**, v.p., $25,000 salary (down $2,792); **W. H. Johnson**, secy., $19,270 salary (up $4,707); **P. G. Larie**, comptroller and asst. treas., $18,112 salary (up $1,274); **T. L. Boyd**, asst. v.p., $22,000 salary (up $1,522); **G. E. Markt**, asst. secy., $12,612 salary (up $965); **C. R. Speers**, asst. v.p., $22,000 salary (up $2,000); **M. Whitlock**, asst. v.p., $18,000 salary (up $2,037); **E. O. Schroeder**, asst. v.p., $15,837 salary; **L. E. Glasgow**, asst. comptroller and asst. treas., $17,112 salary (up $1,274); **V. J. Long**, asst. secy. and asst. treas., $15,612 salary (up $1,274); **W. L. McMillen**, asst. secy. and asst. Treas., $15,612 salary (up $612); **M. L. Rinehart**, asst. treas., $17,126 salary; **A. A. Paradis**, asst. secy., $10,612 salary (up $1,054); **A. R. Bone, Jr.**, regional v.p., $16,500 salary (up $2,037); **W. N. Bump**, regional v.p., $16,500 salary (up $2,037); **T. P. Gould**, regional v.p., $16,500 salary (up $1,922); **S. G. King**, regional v.p., $16,500 (up $2,037); **M. D. Miller**, regional v.p., $16,500 salary (up $2,037).

Caribbean-Atlantic Airlines, Inc.

Dionisio Trigo, pres., $15,000 salary (up $2,500); **Benigno Trigo**, v.p., $6,000 salary (up $1,250); **Frank H. Sheldon**, v.p., traffic, $8,700 salary (up $150); **Jose M. Sierra**, v.p., operations, $11,500 salary (up $750); **L. A. Lockhart**, treas., $8,100 salary (up $150); **Adolfo Valdes**, secy., no salary.

Colonial Airlines, Inc.

Branch T. Dykes, pres. and dir., $22,800 salary (up $6,800); **Alfons B. Landa**, pres. and dir., $1,500 salary (down $5,033.33); **Thomas J. Dunnion**, chief accounting officer, $15,000 salary; **Robert H. Herrnstein**, v.p., traffic and sales (acting), $12,800 salary (up $5,195.70); **James F. Gormley**, treas., $10,922.58 salary (down $1,577.29); **Thomas A. Campo**, asst. treas., $6,370 salary; **Norman D. MacDonald**, treas., $7,261.34 salary (up $1,385.84); **L. Orville Cameron**, v.p., secy., $13,950 salary (up $6,366.67); **Donald A. Duff**, exec. v.p., and gen. mgr., $5,712.49 salary; **Edmond M. Hanrahan**, dir. and chairman of board, no salary; **John J. Murphy**, dir. and chairman exec. comm. $10,000 salary (up $6,500).

NOTE: Amounts shown for Dykes, Campo, and MacDonald represent total 1952 salaries paid, regardless of position held.

Delta Air Lines, Inc.

C. E. Woolman, pres., gen mgr. and dir., $30,000 salary, $5,522 bonus and indirect compensation; **Charles H. Nelson**, v.p., operations, $20,000 salary, $3,094 bonus and indir.; **Laigh C. Parker**,

v.p., traffic and dir., $21,000 salary, $2,660 bonus and indir.; **Todd G. Cole**, comptroller and asst. secy., $12,100 salary, $608 bonus and indir.; **Travis Oliver**, treas. and dir., $1,200 salary; **C. H. McHenry**, secy. and dir., $1,200 salary; **Catherine Fitzgerald**, asst. treas., $5,425 salary (up $625), $1,247 bonus and indir.

Eastern Air Lines, Inc.

E. V. Rickenbacker, pres. and dir., $50,000 salary, $13,283.15 bonus and indirect compensation; **P. H. Brattain**, first v.p. and dir., $30,000 salary, $6,596.51 bonus and indir.; **S. L. Shannon**, second v.p. and dir., $27,500 salary, $4,875.71 bonus and indir.; **T. F. Armstrong**, secy., treas. and dir., $21,875 salary (up $1,875), $3,967.71 bonus and indir.; **L. P. Arnold**, v.p., $22,500 salary, $3,527.87 bonus and indir.; **M. M. Frost**, v.p., $25,000 salary, $2,730.29 bonus and indir.; **C. Froesch**, v.p., $10,900 salary (up $350), $1,973.05 bonus and indir.; **J. H. Brock**, v.p., $17,500 salary, $2,199.98 bonus and indir.; **W. Van Dusen**, v.p., $18,750 salary (up $5,000); **T. E. Creighton**, asst. secy., $9,083.33 salary (up $1,458.33), $616.46 bonus and indir.; **F. L. Farley**, asst. treas. $10,900 salary (up $1,125.07), $1,117.68 bonus and indir.; **W. R. Blackwood**, comptroller, $12,500 salary (up $10,500).

Mid-Continent Airlines, Inc.

Thomas F. Ryan, III, chairman of board, no salary, $600 bonus and indir.; **J. W. Miller**, pres. and dir., $18,102 salary, $600 bonus and indir.; **John A. Cunningham**, v.p., operations, $10,547 salary; **Hugh W. Coburn**, v.p., traffic and sales, $7,598 salary; **C. H. Calhoun**, v.p., engineering and maintenance, $4,639 salary; **W. L. Walker**, treas., $7,969 salary; **P. H. Carr**, secy., $6,400 salary; **W. D. King**, asst. treas., $6,029 salary, **Mary C. Oliver**, asst. secy., $3,084 salary.

NOTE: Figures shown are through August 15, 1952, since merger with Braniff Airways was effective August 16, 1952. Therefore no comparisons with 1951 were made. See issue of April 13, 1953 for 1952 Braniff report.

Northeast Airlines, Inc.

Paul F. Collins, chairman of board, no salary; **George E. Gardner**, pres. and dir., $25,000 salary (up 2c), $5,000 bonus and indirect compensation; **A. A. Lane**, v.p., operations, $15,000 salary (up $600); **R. L. Turner**, v.p., sales, $15,000 salary (up $3,000), $3,000 bonus and indir.; **Hamilton Heard**, treas., $15,000 salary; **H. E. Foley**, clerk, no salary.

Northwest Airlines, Inc.

Croll Hunter, pres., gen. mgr., and dir., $48,000 salary (up $2,250; **Malcolm S. Mackay**, exec. v.p., $30,000 salary (up $1[illegible]00); **E. I. Whyatt**, v.p. and comptroller, $24,000 salary (up $3,000); **Linus C. Glotzbach**, v.p. and asst. to pres., $[illegible]00 salary (up $3,000); **Frank C. J[illegible]**, v.p., operations, $20,000 salary (up $[illegible]; **Amos Culbert**, v.p., sales, $18,[illegible] salary (up $94.10) (resigned Oct. 1[illegible]52); **D. J. King**, v.p. Orient region, $[illegible]0 salary (up $5,230); **L. S. Holstad**, tr[illegible], $18,000 salary (up $2,250); **A. F. F[illegible]**, v.p. and secy., $20,000 salary (up $[illegible]0); **James W. Mariner**, asst. v.p., sa[illegible], $2,786.67 salary (entered office N[illegible]24, 1952); **C. L. Stewart**, asst. secy., $[illegible]0 salary (up $900); **A. D. Piepgras**, a[illegible] treas., $2,833.30 salary (entered office Sept. 22, 1952); **William J. Eiden**, a[illegible] treas., $8,733.31 salary (down $2,-36[illegible]0) (Resigned Sept. 22, 1952).

Facts and Figures...

Figure:

Perennial Maytime favorite in Dallas gardens is the full-blooming genus La Femme Texana Terrifique, also quite popular in at least 11 other months of the year. This delicately-foliaged specimen is the Ann Neyland variety, 18, 110 lbs., 5'5", blonde-topped and blue-eyed.

Fact:

The Southwest Airmotive Sales Department is proud especially of its relationship with the famed "Bendix family". You can fill your needs with certainty and speed from our great inventory of factory-new units and parts by Bendix Products, Scintilla Magneto, and Eclipse-Pioneer, Divisions of the Bendix Aviation Corp.

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Trans-Pacific Airlines, Ltd.

Rudy F. Tongg, pres. and dir., $15,000 salary (down $125); **David A. Benz**, v.p. and dir., $14,000 salary (down $283.37); **Hung Keau Hee**, v.p. and dir., $9,000 salary (up $925); **Richard H. King**, v.p., $9,575 salary; **Archie K. Wong**, secy. and dir., $4,800 salary (down $25); **Clarence D. Young**, treas., $8,475 salary (up $1,175); **Harry A. Bowen**, asst. secy., no salary; **Daniel K. Ainoa**, v.p. and dir., no salary; **Hung Wai Ching**, v.p. and dir., no salary; **Sai Chow Doo**, v.p. and dir., no salary; **Jacob Y. Ing**, v.p. and dir., no salary; **Katsumi Kometani**, v.p. and dir., no salary; **A. Paul Low**, v.p. and dir., no salary; **Richard C. Tongg**, v.p. and dir., no salary.

Western Air Lines, Inc.

T. C. Drinkwater, pres. and dir., $40,312 salary (up $4,583), $650 bonus and indirect compensation; **S. R. Shatto**, v.p. oper. and dir., $24,435 salary (up $4,019), $650 bonus and indir.; **M. W. Landes**, v.p. service & dir., $18,697 salary (up $3,385), $650 bonus and indir.; **A. F. Kelly**, v.p. sales, $18,697 salary (up $3,385); **P. E. Sullivan**, v.p. and secy., $18,697 salary (up $3,385); **J. J. Taylor**, v.p. and treas., $18,697 salary (up $3,385); **D. P. Renda**, asst. secy., $16,421 salary (up $3,151); **Charles J. J. Cox**, comptroller and asst. treas., $11,954 salary (up $6,102).

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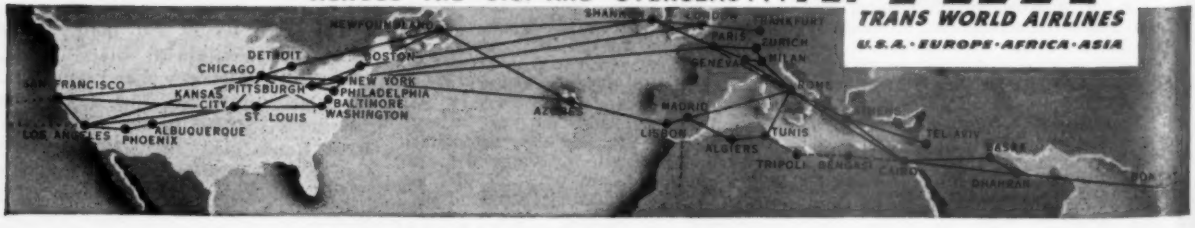

New Machine Speeds Western's Ticketing

Burroughs Ticketeer also keeps sales record, saves on ticket stock, facilitates auditing and accounting.

By ERIC BRAMLEY

A TICKET MACHINE that gives the passenger faster service, retains a record of all sales, facilitates auditing, and saves on ticket stock has been adopted by Western Air Lines.

The first airline to install the Burroughs "Ticketeer" (it's being used by three railroads), Western will shortly have 14 of the machines in operation at principal traffic points. Test installations at Los Angeles and San Francisco were completely successful, WAL said. Machines are leased from the Burroughs Adding Machine Co.

Individual flat metal matrices are used in the issuance of tickets. To issue a Los Angeles-San Francisco round-trip, for example, the agent selects the LAX-SFO round-trip matrix from a rack, inserts it in the machine, and out comes the ticket. The only writing that is necessary on the ticket is flight number, date of flight, and departure time.

Running Total

At the same time that it is printing the necessary information on the ticket, the matrix is also recording several different types of data on a journal inside the machine, and a running total of revenue is kept.

Principal advantages claimed for the Ticketeer are:

- **Speedy** service for the customer;
- **Ease** of operation;
- **Savings** on ticket stock;
- **Savings** in auditing and accounting expense;
- **Faster** day-end balancing;
- **Reduction** in agents' training time.

At the start of a shift, the agent inserts his own coded key into the machine to make it operative. The journal will then record his code number next to every ticket he issues. He also obtains, by inserting a card, the sales total on the machine at the opening of the shift.

At any time during the day, he can insert a card and get a total of sales to that moment. At the end of the shift, he obtains a closing reading. The difference between opening and closing readings gives him the sales total, which he balances against cash, air travel plan sales, etc.

The machine will also issue write-in tickets for points not covered by matrices. At close-out, the agent would add the value of write-ins to the recorded total of printed destination sales.

A matrix is easily handled and its length varies according to the number of coupons to be printed. It prints on the ticket the class of service, type of coupon, origin, destination, fare, tax and total (WAL is also showing the refund value on the return portion of a round-trip ticket). The machine, independent of the matrix, prints on the ticket the date of issue, ticket number, machine identification number, and type of transaction. The latter information—cash, travel plan, etc.—is controlled by the agent through adjustment of a lever.

For a one-way flight, a three-coupon ticket is issued—auditor's coupon, flight coupon and passenger's coupon. A round-trip is four coupons. These are accordion-type tickets, each of which measures 2 by 2½ inches. The machine will hold about 8,000 coupons.

Ticket stock for the Burroughs machine is considerably cheaper than the book-type tickets used by some airlines.

BURROUGHS TICKETEER is 45" high by 16" wide by 20" deep. Note ticket coming from slot on left. Matrix (with tab) has been inserted at front.

Airline sources state that the book-type will cost from $26 to $29 per 1,000. It is possible to obtain stock suitable for the Ticketeer for as low as $1 per 1,000 ($4 per 1,000 for a four-coupon ticket). All coupons issued by the machine are originals—there are no carbons.

The number of matrices needed by an airline depends, of course, on the number of destinations it wishes to cover. In addition to points on its own system, it may want to cover the most frequent interline transactions (WAL at present is limiting the machine to on-line).

Matrices can be made to cover such transactions (a matrix will issue a maximum of five coupons; by inserting two matrices in sequence a 10-coupon ticket could be issued). For cities to which the airline has light traffic volume, write-in tickets can be used.

Those elements of the matrix which control such variable factors as fare and tax are interchangeable in case of tariff revisions.

Traffic Analysis

A carrier can also make its traffic analysis work easier by having a "counter" attached to each matrix. This device records the number of times a particular matrix has been used in a certain period.

Matrices are stored in metal racks. A typed tab on the end of each one enables the agent to locate it easily. Different colored tabs may also be used.

The audit journal, on the inside of the machine, keeps a record of each ticket sold, including such information as type of sale, a coded number for destination, whether ticket was one-way or round-trip, fare, tax, total, ticket number, and seller's identification number. It is also possible to have the journal, which is 5¾ inches wide, record interline data, such as on-line revenue, off-line revenue, and total.

The number of Ticketeers needed in a particular traffic office would depend on the volume of business handled. A major office would probably need one at each agent's position. Others, however, might get along with less, possibly by making arrangements to direct passengers requesting the most frequently traveled routes to a sales position equipped with the machine.

The Ticketeer was originally designed by the General Register Corp. All rights and patents were acquired by Burroughs three years ago. Machines are leased by the company on a monthly rental basis. It also makes up the matrices on order from the carrier. Ticket stock is furnished by the carrier.

• • •

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Trans-Texas Wins Local Service Routes

Extension of Trans-Texas Airways' local service routes from Dallas through Arkansas to Memphis was authorized by the Civil Aeronautics Board last month. The Board, by a 4-0 vote, selected TTA over Pioneer Air Lines and Central Airlines, applicants for substantially the same routes.

Effective June 16, 1953, and valid until March 31, 1954, the new TTA routes are between Dallas, Tyler, Texarkana, Hot Springs, Little Rock and Pine Bluff, and:

• **Beyond Pine Bluff** to Stuttgart, Helena-West Helenz, and Memphis;

•**Beyond Pine Bluff** to Camden, El Dorado, Magnolia, and Shreveport.

In addition, CAB authorized American Airlines to suspend service temporarily at Texarkana in favor of TTA's new service, and eliminated from Chicago & Southern Air Lines' certificate the authority to serve both Pine Bluff and El Dorado.

CAB indicated it selected TTA because of its cost estimates and because it had little other room to expand but north and east. Pioneer was ruled out largely because of its equipment situation, resulting from the recent CAB refusal to underwrite higher costs of Martin 2-0-2 operations.

Central, in need of additional mileage to spread its costs, has other areas for expansion, CAB said, pointing to a recent investigation started to determine if Ozark Airlines' Bartlesville-Kansas City segment should not be transferred to Central.

CAB Firm On S&W Irish Charters

The Civil Aeronautics Board has refused to reverse a decision which would limit approval of an aircraft charter agreement between Seaboard & Western Airlines and Aerlinte Eireann TTA (Irish Airlines) to a two-year period.

The Board's decision of January 28, 1953, had been challenged by S&W and led to a postponement for one year of a trans-Atlantic passenger service contemplated by the Irish line this year.

Agreement calls for charter of aircraft by S&W to the Irish carrier. Originally DC-4 aircraft were involved. Now it involves Lockheed Super-Constellations, which S&W expects delivery on next year.

The CAB, answering the S&W challenge, gave these reasons to back up its two-year approval of the deal:

• **No particular benefits** can be seen accruing to the defense effort under this agreement, which would not also be present if the contract did not exist;

• **Aircraft involved** would be available for defense purposes in any event;

• **The limited period of approval** is in accord with, rather than contrary to, this Government's policy of fostering and encouraging the economic recovery of the nations of Western Europe, such policy being based upon assistance to such countries for a temporary period to enable them to develop their own resources without further aid.

CAB MISCELLANY

Piedmont Aviation wants CAB to authorize a reduction in service to Beckley, W. Va., because present service volume exceeds the city's requirements. Piedmont says annual savings will be about $15,000.

• •

United Air Lines applied for dismissal "without prejudice" of the CAB enforcement proceeding instituted several months ago during the DC-4 coach seating controversy. United and CAB settled the dispute informally and United claims there is no further need for the enforcement case.

• •

Seaboard & Western Airlines wants an exemption to conduct "six to eight" flights between New York and Hamburg this summer carrying passengers in connection with the City of Husum Festival.

• •

Alaska Airlines wants CAB to renew its mail authorization for service between Nome and Anchorage, which expires June 30, 1953. Passenger and property rights over the route are not involved.

• •

National Airlines has asked CAB to reconsider a recent action which permitted a seven-day Miami stop-over tariff of Resort Airlines to become effective. NAL questioned CAB's failure to exercise its suspension powers, claiming Resort has no authority to stop-over that long at Miami.

CAB News

AS OF NOW . . .

The early reports that the Republican Administration would dispose of CAB's complex **New York-Balboa Through Service Proceeding** in expeditious fashion have not proved well-founded. At press-time, the White House, under President Eisenhower, had had the case for three months. For six months prior to that, under former President Truman, the unpublished CAB decision was avoided.

White House sources indicate the pressure of business has prevented any final action on the international proceeding which, like all international air route matters, needs Presidential sanction. The CAB decision, unofficial as it stands, calls for an Eastern-Braniff interchange between New York and Latin America and a National-Panagra-Pan American interchange.

The question of just how fast CAB will handle the **Slick-Flying Tiger Merger Case** depends on the weight the Board attaches to arguments of American Airlines that not only the merger but the issue of renewing the all-cargo lines' temporary certificates should be tried in the same case.

If CAB consolidates the issues, completion of the merger this year is considered unlikely; if the Board denies American's proposal, the all-cargo carriers may still meet their October 1, 1953 target date.

RECENT CAB DECISIONS

• **Western Air Lines** and United Air Lines granted temporary exemptions for one year to transport property between Los Angeles International Airport and Lockheed Air Terminal, Burbank.

• **American Airlines** denied use of Buffalo Municipal Airport for service to Niagara Falls, N. Y., pending a further showing by American the public interest will not be adversely affected.

• **Resort Airlines'** proposed tariff naming seven-day stopovers at Miami on cruises between the U. S. and Latin America, placed under investigation but permitted to become effective pending outcome of the investigation.

CAB CALENDAR

May 12—Oral argument before the Board in Reopened Wiggins Renewal Investigation Case. Washington, D. C. (Docket 5055 et al.).

May 12—Hearing on South Pacific Air Lines' application to serve Hawaii-Society Islands. Washington, D. C. (Docket 5849).

May 14—Conference in Domestic Air Freight Forwarder Investigation. Washington, D. C. (Docket 5947).

June 22—Hearing in Trans-Pacific Certificate Renewal Case. Washington, D. C. (Docket 5031 et al.).

July 6—Hearing in West Coast-Hawaii Case. Washington, D. C. (Docket 5589 et al.).

July 27—Hearing in States-Alaska Case. Washington, D. C. (Docket 5756 et al.).

International Report

Italy's Libellula helicopter grosses 1,433 pounds, has a speed of 93 mph, and a range of 310 miles.

INTERNATIONAL BRIEFS

Agreement is reported near for French government to place final orders for the **SE 210 and HD 45,** two medium-range jet prototypes, scheduled to fly by mid-1955 and to complete airworthiness tests by late 1956.

• •

Swedish sources report that the Royal Swedish Air Force SAAB-29 (J29) swept-wing 660-mph jet fighter **costs about $133,000,** about one-third the cost of comparable American fighters. Operating costs are reported to be about $133 a day.

• •

The Flying Tiger Line and Airwork Ltd., British independent company authorized by the government to inaugurate Atlantic cargo service, have terminated discussions which were reported to have been leading to a working agreement between the two carriers.

• •

Twin-jet, all-weather fighter in production in the Soviet Union has been identified as the **Mikoyan Mik-21,** said to be designed without the collaboration of Mikoyan's usual associate, Gurevich.

Airwork Ltd. has received a permit from the British government to operate **all-cargo services** over the route London-Nicosia-Tripoli (Lebanon)-Kukuk-Baghdad-Basra-Kuwait-Dhahran-Bahrein-Dukhan and/or Jabal Ali with non-traffic stops at Nice, Malta or Rome, and Mersa Matruh or Athens. Permit extends through March 31, 1960.

• •

Lockheed Aircraft Corp. will receive **dollars from VARIG,** Brazilian airline, in payment for its three Super Connies. Contrary to speculation, the down payment was made in dollars.

• •

The **French Nord 2501 transport** will be operated on an experimental basis by Aerovias Brasil along its certificated routes for passengers, mail and cargo, under authorization from Brazilian civil aviation authorities. If satisfactory, the airline is said to be considering a 20-plane order. Brazilian Air Force also is reported to be negotiating for 20, in the event it cannot acquire the Fairchild C-119.

Air France Negotiates For Sikorsky S-55's

Air France has begun negotiations with SNCASE, French licensee for Sikorsky aircraft, for the delivery of four to six Sikorsky S-55 eight-to-10 place helicopters. Negotiations began following Air France's decision to go ahead with its plans for experimental operation of a network of helicopter routes.

Primary purpose of the proposed experimental operation is for Air France to acquire technical and operational know-how in commercial helicopter operations and to train pilots for such services

Tasman Looking for Solent Replacement

Tasman Empire Airways is shopping for an aircraft to replace its Short Solent flying boats, currently flying in the Australia-New Zealand services. Tasman sent representatives to England recently to inspect several Handley Page Hermes aircraft which BOAC is selling at $550,000 each. Initial reaction was reported to be unfavorable.

Originally the carrier had planned to keep the Solents in service until turbine aircraft were available. Apparently it has decided to purchase "stop-gap" aircraft.

French Carriers Sign Cooperative Agreement

Air France and Compagnie des Transports Aeriens Intercontinentaux (TAI), French independent airline, have signed a cooperative agreement to run for a period of five years. The agreement includes financial, technical, and commercial provisions, which would apparently tie the two carriers closely together. Overhaul of TAI's fleet will be made in Air France's shops.

TAI also has announced a management reorganization following the death of General Manager P. Genain. Gen. Georges Fayet has been named to succeed him, with M. Wilmot Roussel as assistant general manager. M. Mathieu has been appointed secretary general, with Messrs. Gaffie, Gonin, and Aubree remaining in their positions of commercial manager, operations manager, and technical manager, respectively.

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People

MANUFACTURING

John David Wright, vice president and general manager of Thompson Products, has been elected to succeed **Frederick C. Crawford** as president. Crawford is moving up to chairman of the board.

Robert M. McIntosh and **Nelson Praigg** are new vice presidents of Hallett Manufacturing Co. McIntosh is vice president and director of sales, and Praigg is vice president in charge of eastern sales.

Edward H. Farmer, former works manager of Lockheed Aircraft Corp., has been elected vice president of manufacturing for Pacific Airmotive Corp.

C. Hart Miller, former executive vice president and general manager of Piasecki Helicopter Corp., has been elected a director of Prewitt Aircraft Co. Miller will also serve Prewitt in an advisory capacity.

Marion E. Jordan, Jr. has been promoted from assistant treasurer to treasurer of the Curtiss-Wright Corp.

E. G. Uhl has been elected a vice president of the Glenn L. Martin Co. to succeed **William B. Bergen** as the firm's engineering head. Bergen has moved up to vice president of operations.

Uhl

Myrhe

AIRLINES

C. A. Myrhe, formerly executive vice president of Frontier Airlines, has been elected president, succeeding **H. S. Darr,** who is now chairman of Pioneer's board. At the same stockholders meeting, **John D. Lindsay** was elected vice president of traffic and sales, and **L. Preston Blatter** was elected treasurer.

Willis Player, formerly with Pan American World Airways as director of public relations, is Northwest Airlines' new vice president of public relations.

Gilbert M. G. Giraud has been appointed assistant to the general sales manager of the Atlantic and Near East Division of Air France. Giraud, prior to this appointment, was in charge of sales for Air France's North African Region.

Vincent Paul Conroy, onetime vice president of traffic and sales for Trans World Airlines, has been appointed vice president in charge of public relations and advertising of the Avis Rent-A-Car System.

Joseph D. Ryle, director of public relations for American Airlines and

chairman of the public relations committee of The Air Transport Association has resigned to accept the post of executive vice president of the Federation for Railway Progress.

MILITARY-GOVERNMENT

Vice Admiral Ralph A. Ofstie, USN, Deputy Chief of Naval Operations (Air), has replaced **Vice Admiral Matthias B. Gardner** as a member of the National Advisory Committee for Aeronautics.

R. Vernon Radcliffe, an examiner with the Civil Aeronautics Board since 1945, has been named assistant to new Board Member **Harmar D. Denny.**

The following employes have recently completed 20 years or more of service in the aviation industry:

• **J. E. Scheafer,** Boeing Airplane Co. Vice president and general manager, Wichita. 25 years.

• **Thomas F. Armstrong,** Eastern Air Lines. Treasurer, New York. 25 years.

• **H. G. Donaldson,** United Air Lines. Flight dispatcher, San Francisco. 25 years.

• **P. T. Sharp,** United Air Lines. Station ground services manager, San Diego. 25 years.

• **W. W. Braznell,** American Airlines. Director, division flight operations, New York. 20 years.

• **W. P. McFail,** American Airlines. Director, regional operations and maintenance, Dallas. 20 years.

• **E. S. Swanson,** American Airlines. Captain, Chicago. 20 years.

• **Levin J. McLeod,** Eastern Air Lines. General purchasing agent, Miami. 20 years.

• **Harry C. Wagner, Jr.,** Eastern Air Lines. Chief mechanic, New York. 20 years.

• **Fred E. Davis,** Eastern Air Lines. Captain, Miami. 20 years.

• **F. Alvin Jones,** Eastern Air Lines. Captain, Miami. 20 years.

• **Joseph B. Kuhn,** Eastern Air Lines. Captain, Miami. 20 years.

• **Walter Wipprecht, Jr.,** Eastern Air Lines. Captain, Miami. 20 years.

• **Charles W. Carneal,** Eastern Air Lines. Captain, New York. 20 years.

• **Wesley F. Phillippi,** Eastern Air Lines. Captain, New York. 20 years.

• **Foster V. Tompkins,** Eastern Air Lines. Captain, New York. 20 years.

• **A. F. Rogers,** Eastern Air Lines. Inspection, Miami. 20 years.

• **B. D. Simpson,** Eastern Air Lines. Foreman, Atlanta. 20 years.

• **Jay Shulenberger,** Eastern Air Lines. Foreman, Miami. 20 years.

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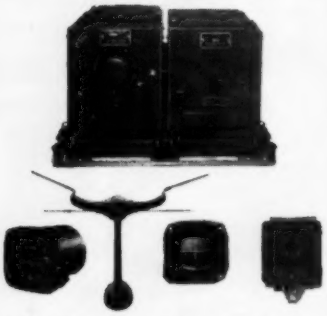

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Letters (*Continued from p. 12*)

cut the safety pilot's view to the left down to about nothing.

In addition I have actually talked to airline pilots who seemed to think that just because they were on a flight plan (VFR) that they were protected from other aircraft and automatically had the right of way. They seemed surprised when I pointed out that a VFR plan gave them no protection or right of way and the other guy had a perfect right to be there too.

All in all, while I agree that Max Karant sometimes exaggerates to make his point, I cannot help but agree with his contention that more should be done to improve the visibility from airliners and to assume that *both* pilots keep a constant lookout at all times, something you know they do *not* in many cases do now.

I sincerely hope you are not taking the airline side on this deal simply because they are bigger and more important, because I feel that in the cases cited the airlines were at least equally if not more to blame than the small plane pilot.

Another symptom I have noted (particularly in military pilots, but the airline boys are involved too) is the fact that far too much reliance is placed on tower clearance and instructions. This has led to several recent collisions in the air and on the ground at tower-controlled fields. Some of this is obviously the fault of the tower, but the point is that some of these pilots get so used to sailing blindly on after the tower clears them that they simply don't look, thinking the tower will do it for them. This is a serious thing and the results prove it.

It all goes to show you've got to look all the time and even that isn't enough, but give the little fellow a break too, he isn't always wrong, which the airlines would like to have the public believe. That is about all AOPA is trying to say, although I grant they may exaggerate some to make the point.

Enjoyed your comments on *Collier's* helicopter article. My sentiments were exactly the same. I sent it to a friend of mine who is on their staff with the request that she give it to the guy who wrote the article.

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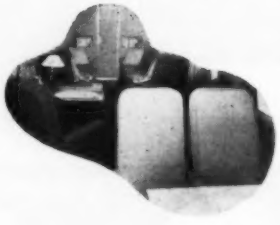

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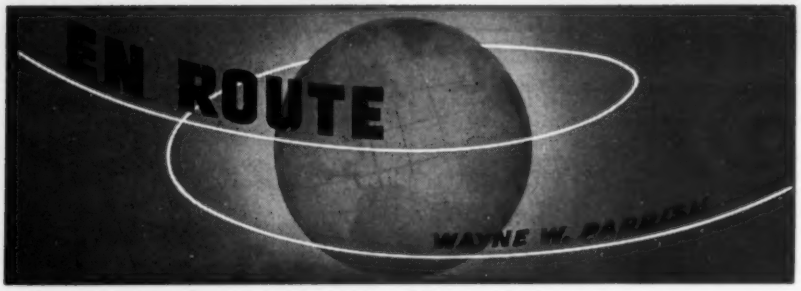

My Crazy Hobby.

I'm as happy as a meadowlark singing from a telephone wire along a country road in the midwest on a warm summer day.

I've just visited 26 new airports.

Nobody else in the world could get happy over that. In fact nobody else in the world could have a hobby as crazy as mine. I intend to land at or take off from every airport served by a scheduled airline in the United States. There are now about 513 such airports. I've visited 363. That leaves about 150 to go. So you can see that hitting 26 new airports in two months is no mean achievement.

This is a very serious hobby entailing (1) a lot of record keeping and (2) a rugged constitution, especially in the posterior portions. Under my own rules I have to either land or take off on a regular scheduled service. Special flights don't count. Making a pass doesn't count.

Sometimes the gods seem to conspire against me, as they did last month in California when weather and a mechanical intervened. It's getting harder and harder to arrange schedules to hit new fields, but bit by bit I'm making the grade. There are still several local service airlines I haven't been on—one, Allegheny, based in my home town of Washington. I haven't been on Lake Central or Piedmont, either. I still haven't hit Douglas-Bisbee Airport in Arizona; Minot, North Dakota; or Elko, Nevada.

Ozark to Tulsa

In March I had a couple of speaking chores to perform, so on the way to that fine gang of 500 at American Airlines' overhaul base at Tulsa I stopped off in St. Louis to visit Ozark Air Lines' new hangar and offices and then flew on Ozark to Tulsa by way of four airports I'd never hit before—Jefferson City-Columbia, Springfield, Joplin, and Miami.

It was a rough trip, believe me, one of the roughest I've ever had, but through no fault of Ozark. It just happened to be one of those days of very high winds sweeping out of the southwest.

Ozark is coming along fine, and in passing I'd like to give a pat on the back to one of the hardest working and most effective gents in the local service airline business. That's **Paul J. Rodgers**, executive assistant to **Laddie Hamilton**, the president, who seems to be completely tireless and always on the go.

In April I took a three weeks' swing to visit all of the aircraft plants on the west coast from San Diego to Seattle and also in the Dallas-Fort Worth area, and to pay a long overdue visit to McDonnell Aircraft in St. Louis. So I spent two weekends "just flying" to hit new airports. Don't ask me why. I just like to fly and I like to see new parts of the country. After all, we've got the finest country in the world and I want to see every part of it.

Palm Springs

So on one Sunday I hied myself down to Los Angeles International Airport and boarded a Western Air Lines' DC-3 and flew to Ontario and Palm Springs, just for the day. Both were new airports for me. I had a very enjoyable few hours seeing the desert resort and flew back to the big city.

I even made the grade by having lunch at that exclusive Racquet Club, thanks to **Jan Guthrie**, who used to be with American Airlines and now handles publicity for Palm Springs, and **Bruce Pickett**, Western's station manager who seems to have the world's finest airline job by holding down Palm Springs nine months of the year when it's cold everywhere else, and then handling the seasonal stop at Jackson, Wyoming, during the three summer months. Bruce just moves with the seasons and likes both the warm desert and the northern mountains. He says he's in a rut, but what a rut!

Santa Ana Scratched

Several days later **Fred Hunter**, our estimable west coast editor, and I hopped on United to San Diego to spend the day at Convair, and after persuading a baffled United reservations gal we managed to get our tickets okeyed for the return flight on Bonanza. It seems that Bonanza stops at Santa Ana which would be one more new airport under my belt.

So what happened but United got its equipment tied up by weather at Los Angeles so it put its own returning passengers on Bonanza, which gave Bonanza a full load of 28 passengers and sure enough, we passed right over Santa Ana and flew direct to Los Angeles International. Now I've got to try again to hit Santa Ana, and that is why my hobby is getting more expensive and time-consuming the farther I go with it. But I reckon Bonanza rather appreciated getting a full load and the passengers were glad to get the service, and I thought United was playing it smart to transfer them over.

Long Way to Seattle

There are two ways of flying from Los Angeles to Seattle. You can go by DC-6 or DC-6B and hum right on through in no time at all, or you can make an expedition out of the trip by going Southwest and West Coast. Naturally I chose the latter—why go the easy way when there are some new airports to see?

So I hopped on a United DC-6 to San Francisco, since I've hit every stop in that area except Salinas, and spent a couple of hours with **Jack Connelly** of Southwest and looking over the SWA Martin 2-0-2's which went into operation April 26, and talked on the phone to **Ed Bolton** of Philippine Air Lines, and then hopped on a Southwest DC-3 at noon with high hopes of stopping at Oakland, Vallejo, Santa Rosa, Ukiah, Fort Bragg, Arcata-Eureka, Crescent City, and transferring at Medford to West Coast Airlines to Seattle via Roseburg, North Bend, Eugene, Albany, Portland, and Olympia.

Seems to me something's always wrong in California. Either there's a record-breaking drought, or a record-breaking rainfall, or cold weather, or forest fires, or fog, or smog, or something. Anyway **Capt. Earl Spencer**, who was most sympathetic to my program, had to pass over Vallejo because of a tough little storm then in progress; this was the second time that the gods have conspired to keep me from seeing that elusive Vallejo airport.

The Gods Conspire

But we hit Santa Rosa okey and then had to pass over Ukiah, also because of weather, but we did hit Fort Bragg and Arcata-Eureka. But having missed two airports I might as well not have made the trip, because I'll have to go through it again. However, the view along the coast on the way to Arcata was magnificent and on a clear day this must be one of the finest airline trips in the country.

My flight terminated in Arcata. I was to lay over an hour and take a later flight on to Crescent City and Medford. The gods conspired again. The later flight was an hour late and when it arrived the pilot stopped before coming to the ramp and revved up his engines and I had a hunch that something was up and sure enough there was a mechanical and the flight was cancelled right there and then.

That meant my connection with WCA at Medford was broken and **Doug Billmeyer** of WCA was waiting there to accompany me to Seattle, and he would be cussing out both me and Southwest for having wrecked his plans. But brother when you're grounded at Arcata-Eureka, you're really grounded. Railroad service is scarce as gold coins. Buses are difficult and infrequent. But SWA had an even later flight coming through that ended up at Medford.

At Least to Medford

So I saw a lot more of Arcata and Eureka than I ever expected to see, and had a very fine dinner at the Eureka Inn, but I wish they'd do something to alleviate the barnlike atmosphere of the dining room. The smorgasbord arrangement was excellent and the swiss steak was one of the best I've ever had. So after three hours in town I went back to the airport keeping my fingers crossed about that last plane to Medford.

Old SWA flight No. 36 not only made it to Arcata but flew on to Crescent City and Medford, Oregon, where I was met at a late hour by **Ed Le Shane**, WCA station manager, and **Bob Nilan**, SWA's manager, and escorted to the Medford Hotel. Doug Billmeyer had given up and returned to Portland. I'll tell you more later.

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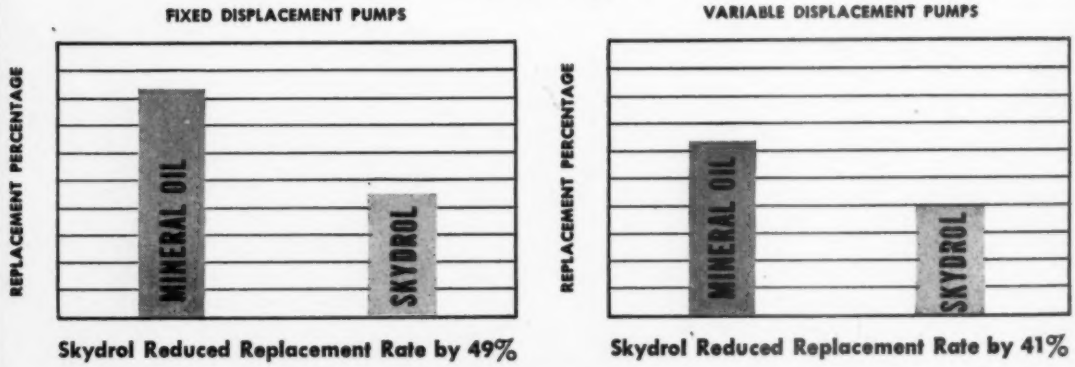

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News at Deadline

CAA to Drop to Four Regions

A decision has been reached to reduce the number of domestic regions of the Civil Aeronautics Administration from seven to four before June 30, it has been announced. Estimated yearly saving: $1.5 million.

The newly formed regions will be based at New York, Kansas City, Fort Worth, and Los Angeles, but allocation of territories for each is not yet known.

It is understood that the four regional administrators will be the ones now serving in those four headquarters. Ora Young, now administrator of the First Region in New York, remains. L. C. Elliott, administrator of the Fourth Region in Fort Worth, remains head of the new region there. Leonard W. Jurden, administrator of the fifth region at Kansas City, will remain there in charge of a larger territory, and J. S. Marriott, of the Sixth Region in Los Angeles, remains in that city.

The other regional administrators will get re-assignments to new positions and will not be released from CAA. Disposition of other regions is not known.

CAA Clears Air on Comet Certification

The CAA has never received a request to certificate any Comet, has never turned down any such request, and sees "no particular delay" likely in certification after action by the British Air Registration Board. Civil Aeronautics Administrator Fred B. Lee thus summed up the situation in a press conference, following a variety of comments in the British press, which alledged that CAA was reluctant to certificate the jet transport.

Smith Sees Turboprop As Transition Engine

Turboprops are the next step for the airlines, which should use them until the turbojet engine is more fully developed, according to C. R. Smith, president of American Airlines. The prospect that turboprop engines (presumably the Allison T56) will become available in the reasonably near future has changed the airline equipment picture, he told a conference on transportation at Syracuse University.

Advantages of the turboprop over the turbojet, as cited by Smith:

- **More rapid take-off acceleration,** with shorter runways as a consequence;
- **Better ground control,** due to reversing propellers;
- **Greater efficiency** at low altitudes and low power, reducing the number of air traffic problems;
- **Less ground noise;**
- **Greater operating economy.**

Reverse Thrust Device

The Douglas Aircraft Co. is developing a reverse thrust device for jet engines. The company, spurred by the lack of attention that the problem is receiving from engine manufacturers, is well along on the project. Better than 50% of the forward thrust would be available for braking action.

Profits Reported by Manufacturers, Carriers

An income of just over $5 million after taxes has been reported by North American Aviation for the first half of its fiscal year (October 1-March 31); comparable figure from last year was $3.3 million. During the same period Beech Aircraft had a net of $764,701, up from the previous year's $651,397.

Curtiss-Wright Corp. netted $2.5 million after taxes during the first quarter of 1953, up from last year's figure of $1.8 million.

During the nine month's ended March 31, McDonnell Aircraft Corp. netted $2.7 million, up from the previous year's $1.8 million.

Among the airlines, American almost doubled its net profit during the first quarter of 1953, reporting $1.9 million, as compared with last year's $985,000 for the period. National Airlines almost matched the figure, reporting earnings of $1.8 million, up 37%. TWA lost $1.3 million during the same period, but this was less than last year's loss of $1.4 million for the same quarter.

Firm Transport Orders Now Total 348

A total of 348 transports, including 8 helicopters, are on firm order by domestic and foreign air carriers, an AMERICAN AVIATION survey revealed. The planes, to be delivered by the third quarter of 1955, include 192 for US airlines and 156 for foreign airlines.

The figures do not agree completely with the C-10 schedule recently announced by the Air Coordinating Committee, which indicated that 391 planes (264 domestic and 127 foreign) had been approved for construction by September 30, 1955. The C-10 schedule does not include orders placed after February 17. ACC's figures, however, include authorized plane construction for which no firm orders are placed.

Used in connection with the C-10 schedule, AMERICAN AVIATION's figures show that about 43 aircraft are being produced without definite orders, about half of them probably by Consolidated Vultee.

No Survivors in BOAC Comet Crash

All the 37 passengers and six crew members were killed when a de Havilland Comet I jetliner of British Overseas Airways Corp. crashed a few minutes after taking off from Calcutta for Delhi on May 2 on a scheduled flight from Singapore to London.

The crash took place during a violent storm. BOAC estimates the plane was at an altitude of 5,000 to 6,000 feet when the last radio report was received from the Comet.

This is the third Comet wash-out to date, but the first involving death to fare-paying passengers. BOAC has been operating Comets since May 1, 1952. The only previous BOAC Comet accident was last October when a jetliner crashed on take-off at Rome; there were no casualtics. The first fatal accident involving a Comet was on March 3 when a Canadian Pacific Airlines Comet IA crashed on take-off at Karachi.

Offer Decca Units For New York Area

An offer to set up a Decca navigational aid system in the New York area at the expense of the manufacturer, Decca Navigator Ltd., was made during the IATA Technical Conference in Puerto Rico. The firm's representative also offered a number of Decca units for use in New York Airways' helicopters. NYA's president, Robert L. Cummings, agreed to consider the offer.

Sites already available in the New York area would offer an accuracy of plus or minus 70 feet within a 25-mile radius of Golden Bridge, N. Y.; plus or minus 100 feet within a 50-mile radius; and plus or minus 200 feet within a 75-mile radius (daytime figures). Fixing coverage would extend to 250 miles.

First Convair Delivery For Alitalia

Alitalia's first Convair 340 has just been delivered. It was ferried from San Diego to Rome via the North Atlantic route and will be used for crew training before being placed in service within Europe this summer. Two more 340's will be delivered to the Italian airline this summer.

French Collaborate on Jet Transport

French production of the twin-jet, 70-passenger SE.210 "Caravelle" will be conducted by means of a collaboration between two manufacturers, SNCASE and SNCASO. The former will be responsible for the fuselage and final assembly, and the latter for the wings. Two Rolls-Royce Avon jet engines will be attached near the rear of the fuselage.

CAA, CAB Budgets Cut in House Move

A budget for the CAA's coming fiscal year has been voted by the House Appropriations Committee, which set the figure at $139,950,000, almost $1 million below the amount requested by the Administration. The CAB took a $50,000 cut in the same bill, being set at $3.75 million.

A stiff warning to the CAA accompanied the financial paring down. The committee asserted that airways user charges are needed immediately, and demanded "action and not mere promises."

Traffic to Double by 1963: Rickenbacker

Bureaucratic thinking is jeopardizing the future of the civil air industry, in the opinion of E. V. Rickenbacker, president of Eastern Air Lines. The current investigation of fares, if it results in lower tariffs, will make it impossible for airlines to lay aside the money needed to equip their fleets with turbine aircraft and helicopters, Rickenbacker told the Aero Club of Washington. As a consequence the taxpayer may in the end have to shoulder the financial burden.

Traffic will reach a total of 60 million passengers per year by 1963, Rickenbacker predicted, more than double the current level, while passenger-miles will almost triple, going from 16 billion to 40 billion.

Rickenbacker sees a future air transport industry on three levels: the jets, traveling in the upper atmosphere at 10 miles per minute; turboprops at lower altitudes, moving at 400 mph; and helicopters with speeds of 200 mph.

Part 45 Permit for Former Heacock Firm

A Part 45 permit, a non-common carrier license, has been issued by the CAA to Air Transport Associates, whose letter of registration as a large irregular recently was revoked. A.T.A. can now engage in military contract work.

Amos E. Heacock, who was president of the carrier, has resigned, according to the company's new president, Duncan Miller. Heacock will reportedly devote himself to running Airline Services, Inc., an overhaul and maintenance firm.

Mechanics' Strike at Braniff Continues

The strike of 500 mechanics at Braniff Airways' Love Field base was still in progress at press-time. The walkout, termed illegal by a representative of the National Mediation Board, started April 13 when the company did not comply with the mechanics' demands that it reinstate a discharged apprentice and remove a crew chief from his post. Braniff suspended service to some cities as a result, but announced that international and former Mid-Continent routes would not be affected.

BOAC Reports First-Year Comet Profit

Some 27,700 revenue passengers rode BOAC's Comets during their inaugural year, and the revenues left BOAC with a profit according to the carrier's chairman, Sir Miles Thomas.

Sir Miles declared that the allocation of costs was a "realistic" one, and the same that is used for all the corporation's aircraft. Responsible in part for the successful first year was an average load factor of 79%, four percentage points above the break-even mark.

Cobb Elected VP

James Cobb, Jr., director of public relations and advertising for Delta Air Lines for several years, has been elected vice president of public relations for the merged Delta-C&S Air Lines.

New Post for Haueter

A combination of Continental Airlines' maintenance, engineering, and operations divisions has been put into effect, with O. R. (Ted) Haueter, vice president of operations, heading the new unit. The action followed the resignation of Harry C. Short, vice president of maintenance and engineering.

Barnes Elected Allegheny President

New president of Allegheny Air lines is Leslie O. Barnes, who joined the carrier three months ago as director of operations. Barnes, who was elected a director as well as president, succeeds Robert M. Love, who was elected chairman of the board.

Barnes' experience in air transport includes work with American Airlines, the CAA, the Air Transport Association, and the National Air Transport Coordinating Committee, of which he was executive director when he joined Allegheny.

Vikings Grounded

A fleet of 27 Vickers Viking twin-engine transports operated by British European Airways has been temporarily grounded following the discovery that a passenger's seat had worked loose because the holding rivets were too short. Rework is now in process.

Air-India International is reported to have grounded its fleet, presumably for the same reason.

Holding Company Asks Airline Control

The Dollar Co., a holding company which has had steamship interests in the recent past, has applied for CAB approval of its proposed acquisition of a controlling interest in South Pacific Air Lines. South Pacific was recently authorized by exemption to operate between Hawaii and Tahiti.

The Dollar Co. told CAB that it is prepared to finance the inauguration of operations to Tahiti; two Sunderland flying boats would be leased to South Pacific by Dollar.

Fixed Base To Handle Army Maintenance

The Fifth Army has contracted with Currey Flying Service of Galesburg, Ill., for all field maintenance on its aircraft and helicopters. The contract, believed to be the first of its kind, covers the entire area of the Fifth Army, including 13 midwest states.

The move marks the first time that a fixed-base operator has been granted a contract for helicopter maintenance. Currey has had about 6 years of Bell helicopter maintenance experience, having operated its own fleet for dusting, spraying, and instruction.

The exact terms of the contract have not yet been revealed, but Currey has already received the first planes.

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In addition, shimmy dampening is more effective because dampening forces are applied at a point where there is the least amount of spring action in the system.

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Bendix engineers welcome the opportunity to assist air frame designers in the application of this Torque-Link Steering to their new airplanes.

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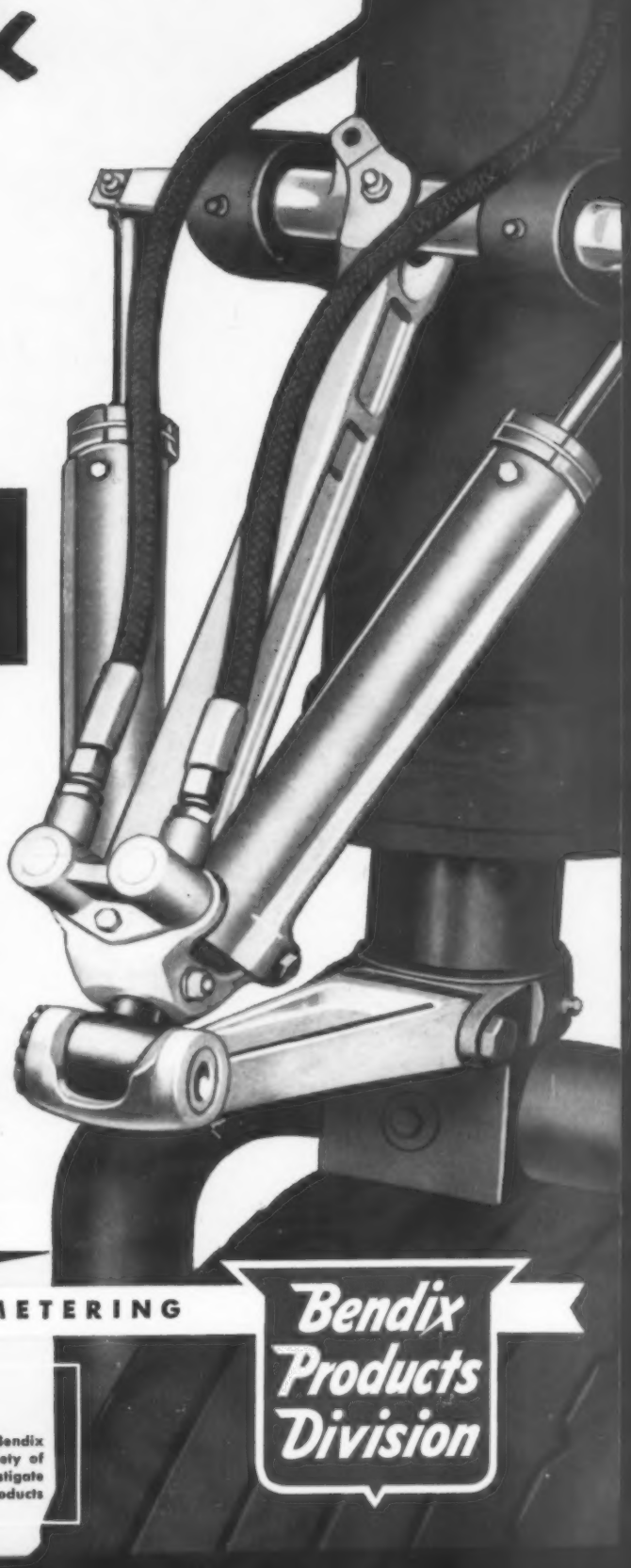

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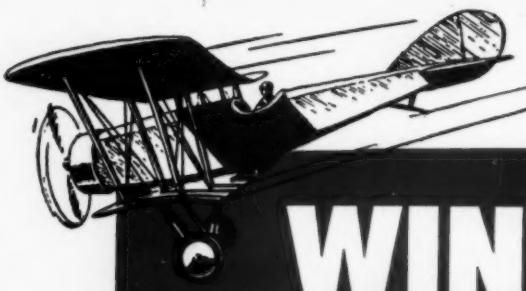

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